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A Multidimensional Analysis of the Maturity of Residential Mortgage Markets in the European Union Countries

ABSTRACT

The volume of housing loans relative to GDP indicates the importance of this segment of intermediation in a country's financial system. Properly analyzed, the market features of a given country – when compared with others – allow for an assessment of its level of maturity. At the same time, such an evaluation of the maturity of the housing loan market can roughly serve as an indication of the stability of the financial system in a given country or group of countries. Research on the characteristics and patterns of the maturation processes of housing loan markets in different countries is relatively scarce and methodologically challenging (among other things, due to heterogeneity).

The goal of the article is to analyze and quantify the maturity level of the housing loan market in 19 European Union countries. The analysis of the collected data used the TOPSIS technique, designed for a synthetic assessment of multi-criteria processes in the form of linear ranking of objects. Nine selected diagnostic indicators of the studied markets were analyzed. The diagnostic indicators of the examined markets and the results were used to create a ranking.

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Meanwhile, the indicators of basic features and the synthetic market maturity indicators were used to group the studied countries. The conducted analysis shows a clear segmentation of the mortgage markets in the examined EU countries according to the applied criteria and indicators, and thus provides evidence that the process of convergence of housing finance models in the European Union remains unfinished, while historical and institutional differences still significantly affect the development level of these markets. The highest positions were taken by Northern and Western European countries, characterized by a deep market, developed refinancing mechanisms based on covered bonds, relatively stable price conditions, and a significant share of fixed-rate loans. This pattern of results indicates that the maturity of the mortgage market is associated not only with the level of mortgage debt, but also with the durability of funding sources, the level of capital market development. At the bottom of the ranking were Hungary, Poland, Romania, Greece, Cyprus, and the Czech Republic.

Keywords: market maturity, residential mortgage lending, multidimensional analysis, TOPSIS method

JEL Codes: G21, F36, C38

INTRODUCTION

The real estate market plays a key role both in the national economy and in the lives of households (Ferrari & Loseto, 2023), affecting the level of investment, employment, and the financial stability of society (Feruś, 2024). It constitutes an important segment of the economy that influences the development of the construction, services, and financial sectors. An indispensable prerequisite for the dynamic development of the residential real estate market is a mature financial intermediation market, which enables the efficient financing of housing investments through the availability of mortgage loans¹ for households. A well-regulated and stable lending policy has a significant impact on the efficiency of the investment process and the liquidity of transactions, stimulating demand for residential property and increasing the purchasing power of households.

The initial research hypothesis assumes that the maturity of residential mortgage markets in the European Union countries is highly differentiated as a consequence of the unequal level of development of the elementary characteristics constituting the Synthetic Market Maturity Index (SMMI). At the same time, based on the review of the literature, it may be concluded that providing a universal explanation of the regularities governing the maturation processes

¹ In the article, we use three terms: residential mortgage loans, mortgage loans, and housing loans. In most European countries, a housing loan (i.e. a loan granted for residential purposes) is secured by a mortgage. However, there are also countries in Europe where guaranteed housing loans (backed by a third-party guarantee) account for a significant share of housing lending, while traditional mortgage loans secured by real property play a smaller role. France is a notable example. There, it is common for banks to accept a guarantee provided by a specialized guarantee institution that undertakes to cover the repayment of the loan in the event of borrower default, instead of relying primarily on a mortgage over the property.

of residential mortgage markets is highly complex, if not impossible. This results, among other things, from the specific and, importantly, evolving systemic context characterising individual markets or groups of markets.

The aim of this article is to provide a multicriteria assessment of the maturity of residential mortgage markets in 19 European Union countries. The structure of the article includes a critical review of the literature devoted primarily to the criteria and indicators used to assess the maturity of residential mortgage markets, while identifying a research gap concerning multicriteria analyses of such maturity. The originality of the article lies in the development of a multicriteria concept for assessing the maturity of the residential mortgage market and in the application of a selected analytical tool to construct a ranking of the maturity of the analysed markets. A separate section discusses mortgage interest rate formulas and the factors determining borrowers' choice of a particular interest rate formula. The choice between fixed-rate and variable-rate mortgage loans significantly affects the credit risk borne by households and, consequently, the stability of the entire residential mortgage portfolio, making this issue an integral component of the assessment of market maturity.

MATURITY OF THE RESIDENTIAL MORTGAGE MARKET

The issue of the maturity of residential mortgage markets remains insufficiently explored in the literature. Market maturity should be understood in relation to the level of development and stability of the mortgage market in a given country or region. By decomposing this concept, it may be concluded that it refers to the extent to which the market is developed in terms of its ability to satisfy the needs of both borrowers and lenders, the range of available products, and the overall efficiency and functioning of the market. The concept of market maturity should therefore combine both the aspect related to market development and that related to market stability.

The European Mortgage Federation adopts the ratio of outstanding mortgage debt to GDP as a measure of mortgage market maturity for the 28 European Union countries (Erol, 2019). This represents a one-dimensional approach, reducing the assessment solely to the size of the residential mortgage market relative to the size of the economy. However, an excessively high ratio of residential mortgage lending to GDP may signal an increased risk of destabilisation of the banking sector. Consequently, a one-dimensional approach to assessing market maturity is insufficient and should be complemented by additional criteria.

A. Bickova and E. Sierminska (Bicakova & Sierminska, 2008) argue that the maturity of the mortgage market depends, on the one hand, on the general legal environment (including contract enforcement, the effectiveness of the judicial system, collateral and bankruptcy regulations), as well as on the availability of credit information and information-sharing mechanisms, and, on the other hand, on the direct regulation of the mortgage market itself. The approach proposed by these authors is regulatory in nature and fits within the broader concept of market development.

The maturity of the residential mortgage market should also be analysed in the context of the market life cycle, encompassing the initial stage, the stage of dynamic growth, and the maturity stage. In this article, the market life cycle concept has been adopted as the analytical framework, deliberately departing from the classical product life cycle model, which assumes a linear and inevitable decline phase that is inappropriate for markets satisfying long-term social needs.

During the initial stage, the mortgage market begins to emerge, and mortgage loans are available only to a limited extent, usually to a narrow group of borrowers, such as high-income households. Credit risk is high, which leads banks to impose stringent down-payment requirements. At the early stage of development, banks rely primarily on traditional sources of financing, such as lending provided by state-owned banks or large commercial banks. At this stage, mortgage interest rates are usually high, while lending conditions remain relatively restrictive. The absence of appropriate regulations may pose threats to the stability of the financial system.

During the stage of dynamic growth, the mortgage market gains increasing importance. More diversified mortgage products become available, tailored to the different needs of consumers. Growing competition among banks contributes to a reduction in borrowing costs. An important feature of this stage is the development of the secondary mortgage market and financial instruments supporting the market, such as covered bonds. Mortgage brokerage also becomes an important distribution channel for mortgage loans.

A market may be regarded as having reached the maturity stage when it achieves stability and financial institutions offer a broad range of products tailored to different market segments. Mortgage products become widespread, diversified, and accessible to a broad group of consumers characterised by a high level of financial literacy. Borrowers make informed decisions regarding the choice between fixed-rate and variable-rate mortgage loans. The secondary mortgage market is well developed and enables banks to manage their mortgage portfolios efficiently. This means that mortgage loans, once originated, can be readily sold or securitised on the secondary market, allowing banks to recover capital quickly and reduce credit risk.

Table 1. Criteria and Characteristics of Residential Mortgage Market Maturity

Criterion	Definition	Potential Impact
Market size and penetration (market depth)	The size and accessibility of the market relative to the economy and households. This criterion makes it possible to assess the extent to which, under given macroeconomic conditions, a broad range of mortgage products is available, tailored to the different needs and financial capabilities of consumers, including fixed-rate mortgages, variable-rate mortgages, and government-supported mortgage loans.	Higher values indicate broader access to the residential mortgage market and a more extensive range of mortgage products.

Table 1. cont.

Criterion	Definition	Potential Impact
Sources and quality of funding	The structure of funding sources for residential mortgage lending in banks (deposits, bonds, covered bonds), taking into account their impact on long-term stability and resilience to market fluctuations.	A high share of covered bonds indicates stable, long-term funding.
Pricing conditions and competition	The level and structure of the cost of residential mortgage loans (including average interest rates and their variability), reflecting the intensity of competition among financial institutions and the efficiency of market mechanisms.	Lower average interest rates combined with low variability (standard deviation) indicate stronger competition and greater financial system stability.
Market saturation	The level of demand for housing finance, indicating the stage reached by the residential mortgage market in terms of its remaining growth potential with respect to new borrowers and mortgage lending dynamics.	A high level of market saturation may indicate greater availability of housing finance and a more developed financial sector; however, it may also reflect high household indebtedness and increased market vulnerability to changes in the business cycle and interest rates.
Consumer awareness and competencies	The level of financial literacy and the ability to make informed borrowing decisions, including the capacity to understand costs, risks (interest rate risk and exchange rate risk), and to compare competing market offers.	A higher level of financial literacy enables consumers to use mortgage credit responsibly, supports product innovation, and limits the risk of excessive household indebtedness.
Housing affordability and housing cost burden	The extent to which households can financially afford to purchase or rent housing, taking into account the relationship between housing costs and household income.	A deterioration in housing affordability may reduce demand and increase housing exclusion within society.
Importance of fixed-rate mortgages	The significance of fixed-rate mortgage lending within the residential mortgage market.	A larger share of fixed-rate mortgages may enhance household financial stability, reduce the risks associated with interest rate fluctuations, and decrease the vulnerability of the housing market to macroeconomic shocks.

Source: Authors' own elaboration.

The criteria presented above constitute a useful instrument for the multicriteria assessment of the degree of maturity of residential mortgage markets. Their combined application makes it possible to conduct a comprehensive analysis of market performance, identify its strengths and weaknesses, and compare the level of development of residential mortgage markets across countries and over time.

MORTGAGE INTEREST RATE FORMULA AND THE MATURITY OF THE RESIDENTIAL MORTGAGE MARKET

In research on the degree of maturity of residential mortgage markets, an important criterion is the diversity of the product offering with respect to lending conditions, particularly mortgage interest rate formulas. As experience has demonstrated, including recent developments in Poland, the interest rate formula affects not only borrowers' ability to service their debt obligations but also their attitudes towards contractual provisions, depending on changes in interest rates and the materialisation of risks associated with the mortgage loan. Consequently, under certain conditions, the interest rate formula may influence both the financial security of consumers and the stability of lending institutions.

For this reason, relatively extensive attention is devoted in this article to the issue of mortgage interest rate formulas. This follows from the adopted research approach, in which one of the dimensions of assessing the maturity of the residential mortgage market is the share of newly granted mortgage loans with an initial interest rate fixation period exceeding one year in the total value of new mortgage lending.

When deciding to take out a mortgage loan, a consumer must consider a number of factors affecting both the cost of borrowing and the timely repayment of debt. One of the key considerations is the choice of the interest rate formula, namely whether the loan will carry a fixed interest rate (fixed-rate mortgage, FRM) or a variable interest rate (adjustable-rate mortgage, ARM).

The European Mortgage Federation (EMF) distinguishes the following categories of mortgage interest rate formulas (European Mortgage Federation, 2024):

- variable-rate mortgages, with an initial interest rate fixation period of up to one year;
- short-term fixed-rate mortgages, with an initial interest rate fixation period between one and five years;
- medium-term fixed-rate mortgages, with an initial interest rate fixation period between five and ten years;
- long-term fixed-rate mortgages, with an initial interest rate fixation period exceeding ten years.

In the case of a fixed-rate mortgage (FRM), the interest rate remains unchanged throughout the entire loan term, providing the borrower with predictable instalments and protection against

the risk of rising interest rates. This type of financing is particularly beneficial for borrowers who prefer financial stability and during periods of low interest rates. However, fixed-rate mortgages usually involve a higher initial interest rate than adjustable-rate mortgages. As demonstrated by K. Ahn et al. (Ahn et al., 2022), borrowers choosing fixed-rate mortgages (FRMs) were willing to make payments that were 12% to 23% higher in order to avoid potential payment shocks associated with adjustable-rate mortgages, corresponding to variable-rate increases ranging from 0.66% to 1.62%.

By contrast, in the case of an adjustable-rate mortgage (ARM), the interest payable depends on the level of a reference rate (e.g., WIBOR or EURIBOR), which may change over time (Albertazzi et al., 2019), thereby affecting the amount of the loan instalment. This type of financing involves greater risk for borrowers because an increase in the reference rate leads directly to higher debt servicing costs. However, during periods of low or declining interest rates, adjustable-rate mortgages may offer more favourable borrowing conditions than fixed-rate mortgages. According to E. Berlinger (Berlinger, 2019), both fixed and variable interest rates involve risk. The choice between an ARM and an FRM therefore represents a trade-off between cash-flow risk and present value risk.

In many markets, including Poland, mortgage loans with temporarily fixed interest rates are also available, representing a compromise between FRMs and ARMs. Under such arrangements, the interest rate is fixed for a specified period, for example five to seven years, after which it is adjusted in accordance with prevailing market conditions and the applicable reference rate. This solution provides a certain degree of stability during the initial period of the loan while allowing borrowers to benefit from potential declines in interest rates in the future.

The consumer's choice of interest rate formula may also be influenced by the costs associated with the early repayment of the loan. In the case of adjustable-rate mortgages (ARMs), this issue is generally of lesser importance because the interest rate adjusts to current market conditions, and banks usually do not incur significant losses resulting from the early repayment of principal.

In the case of fixed-rate mortgages (FRMs), however, early repayment may have significant financial consequences for both the borrower and the lender. As noted by P. Mielus (Mielus, 2017), substantial changes in interest rates may lead to considerable fluctuations in the value of fixed-rate mortgage portfolios. When interest rates decline, borrowers frequently seek to refinance their loans on more favourable terms. This may result in losses for banks that originally granted the loans at higher interest rates, since early repayment deprives them of part of their expected future interest income.

To mitigate such losses and discourage borrowers from refinancing during periods of declining interest rates, banks may impose early repayment charges. The amount of such charges may depend on the difference between the interest rate applicable to the original loan and current market rates, as well as on the remaining maturity of the loan.

In many countries, regulations have been introduced to protect consumers against excessive costs associated with the early repayment of mortgage loans. These regulations include both specific rules governing the calculation of early repayment charges and limits on their maximum amount (European Central Bank, 2009, p. 27). In some legal systems, provisions have also been introduced requiring the gradual reduction of such charges over the life of the mortgage loan.

An analysis of empirical data for the European Union countries indicates substantial cross-country differences in the preferred mortgage interest rate formula. The structure of the mortgage market in this respect is determined by a number of factors, including macroeconomic conditions, the monetary policy of the central bank, the legal and regulatory framework, the level of inflation, and consumers' individual preferences.

Research conducted by the European Central Bank (2009) and J. Y. Campbell et al. (Campbell et al., 2013) demonstrates that clear differences exist across Europe in the dominant mortgage lending models. In countries such as Belgium, France, Germany, and the Netherlands, fixed-rate mortgages (FRMs) predominate, providing borrowers with stable loan instalments throughout the repayment period. The popularity of these loans results, among other factors, from banks' conservative lending policies, strong regulatory supervision, and a stable monetary policy that favours long-term fixed-rate borrowing.

By contrast, in markets such as Austria, Greece, Spain, Portugal, and Italy, adjustable-rate mortgages (ARMs) constitute the dominant lending model. This implies that consumers in these countries are more willing to accept the risk associated with fluctuations in interest rates, which may either reduce or increase borrowing costs depending on prevailing macroeconomic conditions.

It is worth noting, however, that consumers' choices have varied considerably across countries over time (Badarinza et al., 2018, pp. 2275–2288). The structure of the mortgage market with respect to the interest rate formula is not fixed but is subject to the influence of dynamic changes in the economic environment. Factors of particular importance include fluctuations in interest rates, the inflation rate, the correlation between unemployment and short-term interest rates, the financial literacy of households (Albertazzi, 2019), changes in the monetary policy of central banks, and regulatory reforms affecting the availability of different mortgage products. Furthermore, during periods of economic crisis or heightened financial uncertainty, borrowers may exhibit a stronger preference for fixed-rate mortgages in order to minimise the risk of increasing loan instalments. Conversely, during periods of stable or declining inflation, they may prefer adjustable-rate mortgages, expecting lower borrowing costs. Albertazzi U. et al. (Albertazzi et al., 2024) found that the share of newly originated fixed-rate mortgages is higher when the historical volatility of inflation is lower.

As a consequence, the structure of mortgage markets across Europe is continuously evolving, reflecting current economic trends, credit cycles, changes in monetary policy, and individual

consumer preferences. During periods of uncertainty and high interest rate volatility, consumers tend to favour fixed-rate mortgages, whereas in periods of low interest rates, adjustable-rate mortgages become more popular because they may offer lower borrowing costs in the short term.

The literature provides extensive analyses of the determinants of mortgage interest rate choice, taking into account both supply-side factors (decisions made by the banking sector) and demand-side factors (household preferences). Borrowers' decisions to choose either a fixed-rate mortgage (FRM) or an adjustable-rate mortgage (ARM) also result from a complex interaction between macroeconomic conditions, market regulations, and banks' lending strategies. Differences in borrowers' preferences are further explained by household characteristics, including income level, risk tolerance, financial literacy, and the time horizon of financial commitments. In countries characterised by higher levels of borrowers' financial literacy, stable economic conditions, and well-developed financial markets, fixed-rate mortgages are more prevalent. By contrast, in regions where short-term financing strategies predominate and greater flexibility in borrowing costs is preferred, adjustable-rate mortgages are more popular.

The study by M. Ehrmann and M. Ziegelmeyer (Ehrmann & Ziegelmeyer, 2017) identifies several macroeconomic conditions that increase the popularity of adjustable-rate mortgages. According to the authors, adjustable-rate mortgages are more likely to be chosen when:

the spread between long-term and short-term interest rates is high, implying that fixed-rate mortgages may initially be substantially more expensive than adjustable-rate mortgages, thereby making the latter more attractive to borrowers;

economic growth is strong, increasing households' willingness to assume greater financial risk in exchange for potentially lower borrowing costs in the short run;

the unemployment rate exhibits low volatility, making households more willing to accept the uncertainty associated with possible future increases in mortgage repayments.

The literature also emphasises the significant influence of central bank monetary policy on the choice between fixed-rate and adjustable-rate mortgages. By controlling policy interest rates, the central bank directly affects mortgage lending rates, and changes in monetary policy may encourage consumers to choose one interest rate formula over the other, depending on prevailing economic conditions.

It has been argued in the literature that a higher share of adjustable-rate mortgages in the economy strengthens the monetary policy transmission mechanism (Mishkin, 2007). This is because increases in mortgage repayments under adjustable-rate loans reduce borrowers' disposable income, thereby lowering household consumption and, consequently, inflation. This view is not, however, unequivocal. Research by F. Altunok et al. (Altunok et al., 2023) indicates that although higher mortgage repayments are unfavourable for borrowers, they

simultaneously generate higher interest income for banks. Consequently, under conditions of monetary policy tightening, banks with a larger share of adjustable-rate mortgages enjoy more favourable prospects for interest income, which may encourage them to expand the supply of such loans to a greater extent than banks with a lower proportion of adjustable-rate lending. Under these circumstances, the credit channel may partially offset the effects of higher interest rates, thereby reducing the effectiveness of monetary policy. A similar conclusion is reached by F. Core et al. (Core et al., 2025), who demonstrate that the effectiveness of disinflation depends not only on the magnitude of interest rate increases implemented by central banks but also on the manner in which those changes affect firms' behaviour. The monetary transmission mechanism includes a cost-based supply channel, whereby higher interest rates may lead to price increases in certain firms rather than to price reductions.

From the borrower's perspective, when the central bank raises interest rates in order to combat inflation or cool economic activity, the interest rates on adjustable-rate mortgages generally increase as well. Under such circumstances, consumers may prefer fixed-rate mortgages in order to protect themselves against future increases in borrowing costs. Fixed-rate mortgages provide stability of borrowing costs throughout the loan term, which is particularly valuable during periods of economic uncertainty when future monetary policy decisions are difficult to predict.

Conversely, when the central bank lowers interest rates, the cost of adjustable-rate mortgages declines, making them more attractive to borrowers. Falling interest rates may encourage consumers to choose adjustable-rate mortgages because they offer lower borrowing costs in the short run. Under such conditions, borrowers may expect further reductions in interest rates, making adjustable-rate mortgages a more advantageous financing option.

Moreover, consumers' decisions regarding the choice of mortgage interest rate formula are often based on their expectations concerning future changes in interest rates. If borrowers anticipate that the central bank will continue to raise policy rates, they may favour fixed-rate mortgages in order to "lock in" the interest rate at a favourable level. Conversely, if interest rates are expected to remain low or decline further, adjustable-rate mortgages may be perceived as the more advantageous option.

The above research findings indicate that the choice of mortgage interest rate formula is not merely a matter of borrowers' individual preferences but is strongly conditioned by macroeconomic circumstances, the structure of the financial market, and the policies pursued by banks and regulatory authorities. The dynamics of this choice change together with the economic environment, resulting in different lending models prevailing during different periods.

From the supply-side perspective, the determinants of mortgage interest rate choice stem primarily from banks' decisions regarding their funding structure, risk management, balance-sheet characteristics, competitive environment, and adaptation to regulatory and macroeconomic conditions (Sørensen & Lichtenberger, 2007). As financial intermediaries,

banks must strike a balance between profitability and the attractiveness of their mortgage products, resulting in differences in the availability of fixed-rate and adjustable-rate mortgages.

One of the key factors influencing banks' lending strategies is the cost of obtaining funding. When banks finance mortgage lending primarily through short-term deposits, they are generally more willing to grant adjustable-rate mortgages, since this enables them to better match funding costs with lending revenues. Conversely, when financial institutions are able to obtain long-term funding, for example through the issuance of mortgage-backed covered bonds or through mortgage securitisation, the supply of fixed-rate mortgages becomes more competitive.

Banks must also take interest rate risk into account. Fixed-rate mortgages expose banks to greater market risk because the interest rate cannot be adjusted during the term of the loan agreement to reflect prevailing market conditions. An increase in interest rates may result in a situation where the cost of funding exceeds the income generated from the outstanding mortgage portfolio, thereby threatening the bank's financial stability. To hedge against this risk, banks employ various strategies, such as the use of derivative instruments, which generate additional costs. Consequently, during periods of heightened uncertainty, banks may restrict the supply of fixed-rate mortgages or apply higher lending margins to compensate for potential losses.

Research conducted by U. Albertazzi et al. (Albertazzi et al., 2019) points to the dominant role of demand-side factors, which explain as much as 72% of the total variation in the share of fixed-rate mortgages in the total value of mortgage lending across the countries analysed.

The authors nevertheless emphasise the heterogeneity of the demand-side determinants influencing the choice of mortgage interest rate formula, which are generally intertwined with other factors. They demonstrate that the share of newly originated fixed-rate mortgages is higher when:

- historical inflation volatility is low, encouraging borrowers to seek stable financial solutions;
- there is a high correlation between unemployment and short-term interest rates, increasing the perceived risk of sudden changes in the borrowing costs of adjustable-rate mortgages;
- the level of household financial literacy is low, which may result in a preference for fixed-rate mortgages as more predictable and less complex financial products;
- regulations permit mortgage loans to be used as collateral for bank funding instruments, such as covered bonds and mortgage-backed securities (MBS), thereby supporting the availability of fixed-rate mortgages in banks' lending portfolios.

Consumers' choice of the interest rate formula for a mortgage loan is determined by a variety of factors that may be divided into two principal categories: factors related to the pricing of the mortgage product and factors associated with borrower characteristics.

The first group of factors relates directly to the cost of mortgage borrowing. When selecting a mortgage loan, consumers primarily evaluate the difference between the interest rates charged on fixed-rate and adjustable-rate mortgages, as well as their expectations regarding

future changes in interest rates. Research by M. Paiella and A. F. Pozzolo (2007) shows that in markets characterised by relatively high interest rates, borrowers tend to prefer adjustable-rate mortgages. This is because consumers anticipate that interest rates may decline in the future, thereby reducing mortgage borrowing costs and returning them to their historical average levels. Conversely, during periods when interest rates are widely expected to increase, consumers are more likely to choose fixed-rate mortgages because the stability of the interest rate provides a sense of security against future increases in borrowing costs.

The importance of pricing factors in the choice of mortgage interest rate formula is also emphasised by J. Vickery (2007). Examining the impact of changes in mortgage interest rates on consumer choices, the author demonstrates that an increase of only 20 basis points (0.2 percentage points) in the interest rate on fixed-rate mortgages leads to a 17-percentage-point decline in the market share of this type of loan. This finding indicates that consumers are highly sensitive to changes in interest rates, and that higher interest rates on fixed-rate mortgages increase the relative attractiveness of adjustable-rate mortgages, which may appear more appealing in the face of the higher cost of fixed-rate borrowing.

Factors related to borrowers' characteristics also play a crucial role in the decision-making process concerning the choice of mortgage interest rate formula. Income level, educational attainment, financial literacy, age, risk tolerance, as well as debt-to-value and debt-to-income ratios all influence consumers' preferences regarding the choice between fixed-rate and adjustable-rate mortgages.

Households with high incomes and substantial savings are more likely to choose adjustable-rate mortgages because they possess greater financial flexibility and are better able to absorb potential increases in mortgage repayments. As shown by the studies of E. Fortowsky et al. (2011) and J. R. Brueckner and J. R. Follain (1988), borrowers with larger financial reserves may deliberately assume the risk associated with interest rate fluctuations in anticipation of the potential long-term benefits resulting from lower borrowing costs. Conversely, lower-income households, as well as borrowers with limited financial literacy, are more likely to choose fixed-rate mortgages in order to avoid the risk of unexpected increases in loan repayments and the resulting difficulties in servicing their debt obligations. Research by B. Bucks and K. Pence (2008) demonstrates that households with lower incomes and lower levels of educational attainment exhibit greater sensitivity to interest rate changes and are more likely to experience financial distress when borrowing costs increase.

In general, comparative analyses of mortgage markets demonstrate that, as financial systems mature, the share of fixed-rate mortgages tends to increase. Their predominance results not only from the preferences of consumers seeking financial stability but, above all, from the ability of the financial system to transfer and distribute risk over the long term. This reflects a high level of development of the financial infrastructure (including the covered bond market and derivative markets), as well as a stable institutional environment that enables banks to offer

mortgage products with predictable funding costs. The predominance of fixed-rate mortgages is therefore not merely a practical solution for borrowers but also a symptom of market maturity, demonstrating the market's capacity to ensure stability and an efficient allocation of risk across the financial system as a whole.

RESEARCH METHOD

Assessing the maturity of European housing loan markets required the establishment of the criteria that constitute this concept. The selection of criteria was based on theoretical premises, the availability of comparable data, and the authors' research approach. The concept of housing loan market maturity adopted for the purposes of the study comprised criteria directly describing the degree of market development, as well as factors conditioning its maturity, such as the scale of the burden imposed on households by housing costs and consumers' awareness and competencies. Market maturity may be examined in two ways, namely from a static or a dynamic perspective. The static perspective consists in assessing the degree of maturity at a specific point in time, which enables comparisons across countries. The dynamic perspective, by contrast, treats maturity as an evolutionary process and focuses on identifying successive stages (phases) of market development and the mechanisms of transition between them, taking account of institutional, technological, regulatory, and macroeconomic changes. This study adopts a static approach. The research findings presented in the article should therefore be treated as a preliminary stage toward the construction of a comprehensive model of market development based on maturity phases.

The first criterion for assessing market maturity was the size and penetration of the housing loan market, referred to in the article as market depth. This criterion was described using indicators showing the value of housing loan debt relative to GDP and to households' disposable income. Indicators of this type are widely used in international comparisons. They make it possible to compare the size of housing loan markets and their importance in the economy. At the same time, high values of these indicators do not always reflect a higher level of market maturity in qualitative terms, since they may be the consequence of excessive household indebtedness or may result from an earlier credit boom. Subject to this limitation, for the purposes of comparative research it was assumed that higher values of these indicators indicate greater market maturity and are treated as benefit-type variables.

The second criterion for assessing maturity was the structure of mortgage loan funding and the linkage of this funding with the capital market. This criterion concerns the sources and quality of funding. To measure this aspect of maturity, an indicator showing the value of covered bonds outstanding relative to GDP was used. In mature systems, covered bonds are an important instrument for refinancing housing loans, supporting financial stability and the development of capital markets (Borkó et al., 2024). Relying on the development of the housing loan market

exclusively on deposit-based funding should be interpreted negatively from the perspective of housing loan market maturity, even if deposits are characterised by high stability and stickiness.

Two important arguments can be identified to justify including the covered-bonds-to-GDP indicator in the set of diagnostic variables describing market maturity. First, a higher value of covered bonds outstanding relative to GDP indicates a more developed capital market, which enables banks to obtain long-term and more stable funding. This limits credit institutions' dependence on short-term funding sources and reduces the risk of maturity mismatch between assets and liabilities. As a result, it is possible to offer mortgage loans with a longer fixed-rate period, which reduces borrowers' sensitivity to interest rate changes. Countries characterised by a high ratio of covered bonds to GDP more often offer fixed-rate mortgage loans because banks have long-term funding with predictable costs. In less developed markets, where funding comes mainly from deposits, variable-rate loans may play a more important role, which creates risk for borrowers in the event of an increase in interest rates. Consequently, the indicator of the value of covered bonds relative to GDP constitutes an important element in assessing the maturity of the mortgage loan market. Second, market maturity also implies greater diversification of funding sources. A higher ratio of covered bonds to GDP means that banks use more balanced (diversified) funding strategies that are better matched to the specific nature of housing loans.

The third criterion for assessing maturity was pricing conditions and competition. Two indicators were used to describe this criterion: the representative interest rate on newly granted housing loans and the standard deviation of interest rates, used to assess the stability of pricing conditions and the predictability of the debt-servicing cost. It was assumed that more mature markets are characterised not only by a lower level of interest rates, but also by greater interest-rate stability. For the purposes of the study, the standard deviation of housing loan interest rates was calculated over a fifteen-year period (2010–2024). Representative interest rates on new housing loans (annual average based on monthly data, in %) were adopted as the interest-rate indicator.

The fourth criterion for assessing maturity was the saturation of the housing loan market. To measure it, the value of housing loans per capita was used. A high value of this indicator may suggest that households' confidence in mortgage credit is high, which may indirectly indicate the maturity of society's financial culture.

The fifth criterion for assessing market maturity was consumer awareness and competencies. This criterion determines the manner in which available financial products are used, the capacity to assess risk, and the ability to select appropriate credit solutions. Because consumer awareness is not directly observable or easy to measure, an indirect indicator (proxy) was applied, referring to the level of consumers' financial knowledge in the countries under study. For this purpose, surveys conducted periodically by the European Commission were used. The proxy measure adopted was the percentage of respondents who correctly answered at least

four out of five standard questions testing basic financial knowledge, including, among others, understanding of interest rates, inflation, risk, and diversification. This type of measure is widely used in international research (e.g., OECD, World Bank, Standard & Poor's Global Financial Literacy Survey), because it makes it possible to capture, in a comparable and standardised manner, the degree to which households are prepared to make financial decisions.

The sixth criterion for assessing market maturity was the scale of the burden imposed on households by housing costs. For this purpose, the housing cost overburden rate was used, defined as the percentage of the population living in households in which total housing costs exceed 40% of disposable income. This indicator is important from the perspective of market maturity because it reflects the degree to which housing costs and financing conditions are aligned with households' income capacity and, consequently, indirectly indicates the real accessibility of mortgage credit. Low values of the indicator imply a greater capacity of households to service obligations on time, accumulate a down payment, and maintain creditworthiness, which supports the stable functioning of the housing loan market. Conversely, high values signal increased household sensitivity to income shocks and rising interest rates, increasing the risk of repayment arrears and deterioration in the quality of the mortgage loan portfolio. For this reason, the indicator should be treated as a cost-type variable.

The seventh criterion applied in the research on the maturity of housing loan markets in Europe was the criterion defining the role of fixed-rate loans in the market. The study assumed that a mature market is characterised by a greater share of fixed-rate loans in the overall volume and in new lending. This approach is justified by research findings showing that a higher share of fixed-rate loans reduces households' sensitivity to interest-rate shocks, stabilises the debt-servicing stream over the business cycle, and lowers the probability of a sharp increase in debtors' burdens under conditions of monetary policy tightening. To capture this criterion empirically, the indicator of the share of housing loans with an interest-rate fixation period longer than one year in the value of newly granted loans was used. This measure captures the current contractual structure of new lending.

Ultimately, nine diagnostic variables (CD1-CD9) were selected to conduct the multidimensional comparative analysis; together with the formulas for their calculation and the direction of interpretation (division into benefit-type and cost-type variables), they are presented in Table 2. Statistical data made available by HYPOSTAT and the European Commission were used in the research.

Table 2. Diagnostic indicators selected to assess the maturity of housing loan markets in the EU

Criterion	Indicator	Calculation formula	Interpretation of the diagnostic variable	Source of statistical data
Market size and penetration (market depth)	Outstanding residential loans to GDP ratio (CD1)	Value of outstanding residential loans (in EUR million) relative to GDP	Benefit criterion	HYPOSTAT data; data for 2024
	Outstanding residential loans to disposable income ratio (CD2)	Value of outstanding residential loans relative to households' disposable income	Benefit criterion	HYPOSTAT data; data for 2024
Sources and quality of funding	Mortgage-backed covered bonds outstanding to GDP ratio (CD3)	Value of mortgage-backed covered bonds outstanding relative to GDP	Benefit criterion	HYPOSTAT data; data for 2024
Pricing conditions and competition	Representative interest rate on new mortgage loans (CD4)	Representative interest rate on new mortgage loans (annual average based on monthly data, in %)	Cost criterion	HYPOSTAT data; data for 2024
	Standard deviation of representative interest rates on new mortgage loans (CD5)	Standard deviation of representative interest rates on new mortgage loans (annual average based on monthly data, in %)	Cost criterion	HYPOSTAT data; standard deviation calculated on annual data from 2010–2024
Market saturation	Outstanding residential loans per capita (CD6)	Value of outstanding residential loans per inhabitant	Benefit criterion	HYPOSTAT data; data for 2024
Consumer awareness and competencies	Financial knowledge (CD7)	Percentage of respondents who correctly answered 4 out of 5 questions testing financial knowledge	Benefit criterion	European Commission; 2023. The survey was conducted in March–April 2023

Table 2. cont.

Criterion	Indicator	Calculation formula	Interpretation of the diagnostic variable	Source of statistical data
Accessibility and housing cost burden	Housing cost overburden rate (CD8)	Percentage of the population living in households in which total housing costs (after deduction of housing allowances) exceed 40% of disposable income (also after deduction of housing allowances).	Cost criterion	European Commission/Eurostat; data for 2024
Role of fixed interest rates	Share of gross residential lending with an interest-rate fixation period of over one year (CD9)	The value of gross residential lending with an interest-rate fixation period of over one year as a share of total gross residential lending in a given year, expressed as a percentage.	Benefit criterion	HYPOSTAT data; data for 2024

Source: Authors' own elaboration.

The criteria and indicators presented above were used to assess the degree of maturity of housing loan markets in 19 EU countries as at the end of 2024. The selection of countries was caused by the lack of a complete data set. The countries included in the analysis constitute the core of the European housing loan market, whereas the countries excluded from the study are characterised by a marginal share in the European housing loan market.

Assessing the degree of maturity of housing loan markets in European Union countries required the use of a tool capable of capturing the multifaceted nature of this phenomenon. Market maturity is not reducible to a single dimension; rather, it reflects the coexistence of a larger number of elements (criteria, indicators), which makes it a category that is not directly observable. For this reason, an approach based on methods of multidimensional comparative analysis was adopted². This enables the aggregation and transformation of many diverse partial indicators into one coherent synthetic measure that allows comparisons across countries. The literature emphasises that 'the basic objective of multidimensional comparative analysis is the construction of a synthetic measure enabling the comparison of elements of a set (objects) described by many variables (features)' (Bąk, 2013). 'Methods of linear ordering are often used to achieve this objective' (Bąk, 2013).

The study of the maturity of housing loan markets in the EU was based on the well-established TOPSIS method (Technique for Order Preference by Similarity to Ideal Solution) (Tzeng &

² The term statistical multidimensional analysis is also used (Gatnar and Walesiak, 2004).

Huang, 2011). The method was developed by C. L. Hwang and K. Yoon, who introduced it in 1981. Originally, TOPSIS was designed as a tool supporting multi-criteria decision-making (MCDM) problems (Kisielinska & Borkowski, 2022). The TOPSIS method is increasingly used in comparative studies (Bulgurcu, 2012). The original TOPSIS procedure (Dworniczak, 2012) was adapted to the needs of studying the maturity of mortgage loan markets. The analytical procedure consisted of six stages:

- 1) Construction of the decision matrix – a country-by-indicator matrix used to assess the maturity of housing loan markets.
- 2) Data normalisation – bringing indicator values to a common scale so that they are comparable.
- 3) Determination of the positive ideal solution (PIS) and the negative ideal solution (NIS) – the best and worst values for each indicator.
- 4) Calculation of the separation measures of the alternatives from both reference solutions.
- 5) Calculation of the relative closeness coefficient – the closer the value is to 1, the higher the alternative is assessed in terms of maturity.
- 6) Ranking of alternatives – ordering them from the best to the worst.

As a result of applying the TOPSIS procedure, a synthetic maturity indicator (SMI) was obtained, which made it possible to rank countries according to the level of maturity of the housing loan market.

The SMI value for a given country, interpreted as relative closeness to the positive ideal solution (PIS), is a natural consequence of the selection of diagnostic variables for the analysis and of the TOPSIS method itself. Thus, a change in the set of countries or diagnostic variables under study may affect the calculation results and the linear ordering of the alternatives. As a result of applying the TOPSIS method, a ranking of EU countries was obtained in terms of the maturity of housing loan markets.

No weights were applied to individual indicators in the analysis; instead, equal importance was assigned to all indicators in assessing the maturity of housing loan markets. This decision resulted from the fact that the literature does not provide unequivocal grounds for ranking the importance of individual aspects of market maturity. Introducing weights under such conditions could increase the arbitrariness of the assessment procedure and negatively affect the results of cross-country comparisons.

The zero unitarisation method was used to normalise the variables (Kukuła, 2000). ‘The purpose of normalising features is to enable broad comparative studies of objects with respect to the level of many variables (features) adopted as criteria for assessing the complex phenomenon under consideration’ (Kukuła, 1999). The following formulas were used to normalise benefit-type and cost-type variables (Kukuła, 2000). In the case of cost-type variables, the zero unitarisation procedure was applied, whereby variables with an undesirable direction of preference were

transformed into benefit-type variables and simultaneously normalised according to the following formula (Kukuła, 2000):

$$Z_{ij} = \frac{\max(x_j) - x_{ij}}{\max(x_j) - \min(x_j)}$$

where x_{ij} denotes the value of the j -th feature for the i -th country, while $\min(x_j)$ and $\max(x_j)$ are, respectively, the minimum and maximum values of this feature in the set of EU countries under study. As a result of the transformation, variables in the interval $[0,1]$ were obtained, with higher values indicating a more favourable assessment under a given criterion. For benefit-type variables, normalisation was carried out using the zero unitarisation method according to the formula:

$$Z_{ij} = \frac{x_{ij} - \min(x_j)}{\max(x_j) - \min(x_j)}$$

As a result of zero unitarisation, a normalised decision matrix was obtained and used in the subsequent stages of the TOPSIS method.

In the next stage, the parameters of the reference solutions were determined, and then the separation measure of the alternative – the housing loan market in country X belonging to the EU – from the positive ideal solution (PIS) and the negative ideal solution (NIS) was calculated. The Euclidean metric was adopted as the distance measure. Finally, for the market in country X, the SMI was calculated as the ratio of the distance of market X from the NIS to the sum of the distances of market X from the PIS and the NIS; it falls within the interval from 0 to 1. The value '1' characterises a mature market – one close to the positive ideal solution. By contrast, the value '0' characterises the least mature market.

Several arguments support the selection of the TOPSIS method for the study. TOPSIS makes it possible to take into account a larger number of criteria simultaneously, regardless of their scale and direction of preference, which increases the objectivity of classification and limits arbitrariness in selecting the weights of individual criteria. In addition, it allows the precise determination of the separation of each market from the positive ideal solution and the negative ideal solution, which facilitates the construction of rankings and the identification of markets with a similar degree of maturity. In the TOPSIS method, the housing loan market in the EU countries under study is assessed with reference to two reference solutions that constitute the basis of evaluation, i.e., the positive ideal solution (PIS), representing a hypothetical state in which all analysed indicators reach the most desirable values, and the negative ideal solution (NIS), representing the opposite case. This property distinguishes the TOPSIS method from the Hellwig method commonly used in Polish studies (Hellwig, 1968), in which the synthetic assessment is based on the relation of an object to a positive development pattern. For this reason, TOPSIS is a particularly useful tool for multi-criteria comparisons and the construction of rankings of markets with a similar degree of maturity.

The method discussed belongs to the class of linear ordering methods, which enable the ordering of analysed objects (e.g., housing loan markets) on a one-dimensional scale with an unambiguous interpretation, although originally it was a method supporting multi-criteria decision-making (Hwang & Yoon, 1981). The main advantages of linear ordering methods include simplicity of interpretation and ease of comparisons between objects. However, this approach entails certain limitations. These methods assume the linearisation of a multidimensional feature space, which enables the construction of an unambiguous ranking but at the same time leads to the loss of information about nonlinear relationships between indicators and to the omission of threshold effects and specific interactions between criteria.

In summary, the approach based on the TOPSIS method is a useful solution, although not without limitations, because on the one hand it allows a comprehensive assessment of the maturity of mortgage loan markets while taking into account their multidimensional nature, but on the other hand the results depend on the normalisation scheme and the weighting scheme adopted for individual indicators.

DESCRIPTION OF RESEARCH RESULTS

The first element of the study was the construction of a matrix of countries and indicators used to assess the maturity of housing loan markets. The values of the indicators included in the study are presented in Table 3.

Table 3. Values of diagnostic indicators of housing loan market maturity in 19 EU countries

Country	CD1	CD2	CD3	CD4	CD5	CD6	CD7	CD8	CD9
Austria	27.0	42.5	19.8	3.89	0.80	14,194	28	6.3	76.9
Belgium	52.8	89.7	9.1	3.41	0.86	27,418	30	6.7	92.9
Cyprus	25.3	43.5	1.9	4.70	1.24	8,783	19	2.4	48.4
Czechia	21.4	40.6	4.7	5.16	1.27	6,271	25	9.2	93.2
Denmark	70.2	150.0	109.8	4.73	1.30	46,750	40	14.6	61.3
Finland	38.3	65.6	17.9	3.99	1.13	18,873	40	5.4	3.8
France	43.9	68.0	12.9	3.41	0.97	18,741	25	7	96.0
Germany	43.9	71.2	6.9	3.80	0.97	22,665	32	12	88.2
Greece	11.4	17.5	4.1	4.06	0.55	2,595	19	28.9	70.4
Hungary	7.5	12.4	2.5	7.28	2.48	1,612	22	9	99.8
Ireland	15.5	52.1	2.4	4.04	0.38	15,419	31	4.5	69.5

Table 3. cont.

Country	CD1	CD2	CD3	CD4	CD5	CD6	CD7	CD8	CD9
Italy	19.4	30.6	7.3	3.11	1.00	7,228	25	5.1	88.6
Netherlands	78.5	159.9	19.7	3.93	1.01	49,609	43	6.9	84.3
Poland	13.7	23.4	0.4	7.65	1.70	3,169	20	5.2	78.1
Portugal	36.5	55.9	13.9	3.67	1.11	9,785	16	6.9	78.0
Romania	6.3	12.4	0.0	6.44	1.01	1,161	13	4.7	68.0
Slovakia	31.1	50.9	11.4	4.42	1.50	7,512	27	6.4	95.0
Spain	29.8	49.0	11.7	3.35	0.72	9,759	19	7.8	87.7
Sweden	82.8	172.8	39.9	4.14	1.06	44,230	34	10.6	15.0

Source: Authors' own elaboration based on HYPOSTAT and European Commission data.

In 2024, the ratio of the value of housing loans outstanding to GDP (CD1) in the analysed group of 19 EU countries was characterised by high heterogeneity. This indicates varying degrees of development of these markets and their role in the economies of the EU countries under study. The mean value of the indicator was 34.49%, while the median stood at 29.8%. Dispersion was substantial, as the standard deviation amounted to 22.97 percentage points and the coefficient of variation stood at 66.61%, confirming the strong differentiation of the population under study. The highest values were recorded in the Scandinavian countries and the Netherlands, while the lowest occurred in Central and Eastern European and Southern European countries (Romania, Hungary, Greece).

Poland, with an indicator of 13.7%, was placed in the lower part of the group of countries under study. An analysis of Hypostat data shows that in 2015–2024 Poland's distance from the EU-27 average did not decrease but slightly widened (the gap increased from approx. 23.2 percentage points in 2015 to 24.6 percentage points in 2024). This means that after a period of growth in the indicator in the first half of the previous decade, the convergence process weakened.

The stability of this indicator over time was also assessed in the group of countries under study³. The analysis covered the years 2001–2024. The results obtained indicate that mortgage loan markets in the countries under study developed asynchronously and were subject to strong cyclical shocks. In Central and Eastern European countries, the pattern of catching up from a low initial level dominated; however, in recent years stabilisation or a decline in the indicator has been observed more often, which may reflect a limitation of new lending and the impact of changes in nominal GDP.

³ The stability of the indicator was assessed by analysing the variability of its trajectory over time in 2001–2024, in particular on the basis of the standard deviation and coefficient of variation calculated for individual countries, supplemented by an assessment of turning points in crisis periods.

In 2024, the ratio of the value of housing loans outstanding to households' disposable income (CD2) in the analysed group of 19 countries was also characterised by very high variability. The mean value was 63.58%, while the median was 50.9%, which indicates a right-skewed distribution. Dispersion was substantial, as evidenced by the standard deviation of 47.98 percentage points. The coefficient of variation was 75.47%, confirming the strong heterogeneity of the group of countries under study.

In 2024, the indicator of the value of mortgage covered bonds outstanding relative to GDP (in %) (CD3) also varied strongly across the countries under study. The mean was 15.59%, while the median was 9.1%, which indicates a strongly right-skewed distribution. The coefficient of variation was 158.47%, confirming that the level of development of the covered bond segment differs radically across countries. In general, Europe features the coexistence of countries in which the mortgage covered bond market is of marginal importance (almost close to zero) and a few economies where it is a key instrument for refinancing mortgage loans.

In 2024, the interest rate on newly granted housing loans (annual average, in %) (CD4) in the analysed group of countries averaged 4.48%, with a median of 4.04%. The differentiation in the level of interest rates was moderately high. The standard deviation was 1.30 percentage points and the coefficient of variation was 28.91%. At the same time, the extreme values ranged from 3.11% to 7.65% (range of 4.54 percentage points), indicating the coexistence of markets with relatively moderate financing costs and markets with significantly higher credit costs for consumers.

Interest-rate volatility in the long term, measured by the standard deviation over 2010–2024 (CD5), points to significant differences in the stability of pricing conditions across the analysed countries. The mean value of this measure was 1.11 percentage points, while the median was 1.01 percentage points, suggesting that in a 'typical' country under study, interest-rate fluctuations in the analysed period oscillated around approx. 1 percentage point. However, the range of values was broad (0.38–2.48 percentage points; range of 2.10 percentage points), indicating that, alongside markets with relatively stable pricing conditions (standard deviation of approx. 0.5–0.7 percentage points), there were also countries with distinctly greater volatility, reflecting a less predictable interest-rate environment.

In 2024, the indicator of the value of housing loans per capita (CD6) in the group of EU countries under study was characterised by very large variation (from EUR 1,161 to EUR 49,609), which would indicate the coexistence of markets with marginal credit saturation and economies with a very high scale of housing indebtedness per inhabitant. The highest values were recorded in highly developed countries, whereas in some of the countries under study the indicator did not exceed several thousand euros. Poland (EUR 3,169) was placed in the lower part of the distribution, indicating a relatively low level of saturation of the housing loan market per inhabitant.

Consumers' financial knowledge was assessed using the percentage of respondents who correctly answered at least 4 out of 5 questions testing basic financial knowledge (CD7). It was assumed that a higher value of the indicator means a higher level of competencies and thus (in qualitative terms) greater maturity of the demand-side environment of the housing loan market. The mean percentage of such respondents was 26.7%, with a median of 25%. Variation was moderate (standard deviation of 8.5 percentage points). Analysis of the indicator using descriptive statistics tools points to the coexistence of countries with relatively high financial awareness ($\geq 40\%$) and countries with clear deficits ($\leq 16\%$), which may limit the 'qualitative' maturity of the market through households' weaker capacity to assess the costs and risks associated with taking out a housing loan.

The housing cost overburden rate (CD8), defined as the percentage of the population living in households in which total housing costs exceed 40% of disposable income, in 2024 was characterised by substantial variation in the analysed group of 19 countries. The mean value of the indicator was 8.40%, while the median was 6.9%, which indicates a right-skewed distribution. Dispersion was relatively high, as the standard deviation was 5.58 percentage points and the coefficient of variation was 66.38%. This means significant heterogeneity of the population of countries under study in terms of the scale of the burden placed on households by housing costs.

The final indicator included in the study was the share of fixed-rate housing loans in newly granted housing loans in the analysed countries (CD9). The mean value of the analysed indicator was 73.43%, with a standard deviation of 26.20 percentage points and a coefficient of variation of 35.68%. This means that in 2024 there was high differentiation of the indicator among the EU countries under study. It may be concluded that the share of fixed-rate loans was a strongly differentiating feature of the population of countries under study. It may therefore be regarded as a diagnostic variable that is analytically useful in comparative studies on the maturity of housing loan markets in the EU.

In accordance with the analytical procedure presented earlier, in the subsequent steps the data were normalised, the positive ideal solution (PIS) and the negative ideal solution (NIS) were determined, and then relative closeness coefficients were calculated. On this basis, the countries under study were ranked in terms of the level of maturity of the housing loan market.

Table 4. Synthetic maturity indicator and ranking of housing loan market maturity in 19 EU countries according to data as at the end of 2024⁴

Countries	SMI	Ranking
Netherlands	0.730	1
Denmark	0.730	2
Sweden	0.642	3
Belgium	0.609	4
France	0.555	5
Germany	0.552	6
Ireland	0.514	7
Austria	0.513	8
Finland	0.501	9
Spain	0.498	10
Italy	0.490	11
Slovakia	0.479	12
Portugal	0.476	13
Czechia	0.436	14
Cyprus	0.420	15
Greece	0.377	16
Romania	0.362	17
Poland	0.348	18
Hungary	0.339	19

Source: Authors' own elaboration.

The SMI values were subjected to descriptive statistical analysis involving the calculation of the mean and standard deviation, which made it possible to characterise the differentiation of the maturity of housing loan markets in the group of EU countries under study. The mean value of the SMI scores obtained was 0.504, while the standard deviation was 0.115. The SMI ranking obtained as a result of applying the TOPSIS procedure indicates clear segmentation of European housing loan markets, because the values of the indicator form clusters enabling the identification of several relatively homogeneous groups of countries. It is also worth highlighting

⁴ For measure CD7, data from 2023 were used.

the interpretative limitations of the TOPSIS-based indicator. In the study, it can only be inferred that the housing loan market of country A is, in terms of maturity, closer to the PIS and farther from the NIS than the market of country B, whereas the adopted research method does not warrant the statement that the housing loan market in country A is, for example, 0.10 units more mature than in another country under study.

On the basis of the research conducted, four relatively homogeneous groups of countries can be distinguished, differing in the configuration of the features that constitute housing loan market maturity.

The first group comprised countries with the highest values of the synthetic measure (value range from 0.642 to 0.731). This group included the Netherlands, Denmark, and Sweden. The group under discussion stands out from the others due to the very high depth of the housing loan market, as evidenced by high levels of the ratios of housing loans to GDP and to disposable income. A notable feature of these countries is also the significant role of the covered bond market in refinancing housing loan portfolios.

The second group comprised countries with high values of the synthetic measure, yet clearly lower than in the first group (range 0.552–0.609). According to the SMI ranking obtained, this group included Belgium, France, and Germany. In terms of the maturity of housing loan markets, these are markets characterised by a large scale and importance of mortgage credit in the economy, a relatively favourable pricing profile, and more stable financing conditions compared with countries with lower SMI scores. A feature of this group is also the important role of covered bonds as a refinancing instrument, which points to a strong linkage between mortgage funding and the capital market and a better matching of funding maturities to the long horizon of housing loans, which should support financial stability. Another characteristic supporting the resilience of the financial system is the relatively high share of fixed-rate loans in new lending, which limits households' exposure to interest-rate fluctuations and strengthens the resilience of the mortgage portfolio.

The third group (0.476–0.514) comprised the following countries: Ireland, Austria, Finland, Spain, Italy, Slovakia, and Portugal. Within this group, two subgroups are visible, which achieved a similar SMI level with a different structure of diagnostic variables. The first included Austria, Ireland, Italy, and Spain. In terms of maturity, these are markets with a greater role of fixed-rate loans in newly granted loans (CD9), which limits households' exposure to interest-rate risk. The second subgroup included Finland, Portugal, and Slovakia. This subgroup was characterised by relatively greater market depth and a greater role of covered bonds.

The fourth group consists of countries with the lowest values of the synthetic measure, falling within the range of 0.339–0.436. According to the ranking obtained, this group included the following countries: Czechia, Cyprus, Greece, Romania, Poland, and Hungary. This group of countries stands out from the other groups under study due to low indicators defining the size of the housing loan market. In addition, these are compounded by less favourable parameters of

pricing conditions or socioeconomic factors, which may limit the capacity of these markets for durable and sustainable development and increase their sensitivity to macroeconomic shocks.

The SMI ranking indicates the relative advantage of 'old' EU countries in the synthetic assessment of the maturity of housing loan markets, while Central and Eastern European countries were mostly located in the lower part of the distribution of SMI values. At the same time, it should be noted that some Southern European countries also recorded low SMI values, suggesting that the picture of housing loan market maturity in Europe is more complex.

Poland's position in the SMI ranking is relatively low. This means that, within the adopted set of diagnostic variables, Poland is characterised by lower relative closeness to the positive ideal solution and, simultaneously, a shorter distance from the negative ideal solution, both determined on the basis of the highest and lowest values of individual diagnostic variables in the group of countries under study. This result stems primarily from lower values of indicators describing the depth and saturation of the housing loan market (loan-to-GDP and loan-to-disposable-income ratios, as well as loans per capita), and also from relatively weaker parameters in the area of the structure and quality of funding, including the low role of mortgage covered bonds as an instrument for refinancing housing loans, which limits the linkage between mortgage funding and the capital market. In comparative terms, this indicates that the housing loan market in Poland plays a relatively smaller role in the economy than in the countries with the highest maturity, while the process of convergence towards the most developed housing finance models remains limited.

The study conducted is associated with certain methodological limitations that should be taken into account when interpreting the results. The SMI is a quantitative measure of the relative closeness of an alternative to the positive ideal solution and, simultaneously, its distance from the negative ideal solution, determined within the space of 19 EU countries. It is therefore legitimate to conclude that a given country is closer to the desired solution than another country, although it should be emphasised that the reference solution is relative rather than normative. In other words, it depends on the level of indicators in the population under study. Consequently, SMI values and ranking positions are sensitive to the composition of the countries under study, the selection and number of diagnostic variables, and the method of their normalisation. This implies an important limitation of the SMI. The SMI therefore serves only as an ordering tool and is used for comparative assessment within the adopted methodological framework. It is not, however, a measure of 'absolute' maturity. The literature also notes that '(...) there is a high probability of misinterpreting the obtained results due to the diversification of the positions of units between which there are no visible differences in the quality defined by diagnostic variables' (Jarocka, 2015). An additional limitation is that indicators reflecting market scale (e.g., the ratio of mortgage loans to GDP) do not always indicate a high level of market maturity, as they may also result from episodes of excessive credit expansion and the accumulation of financial leverage, which justifies a cautious interpretation of the results.

The study was static in nature. The synthetic maturity indicator reflects only the relative position of the markets under study at a given point in time, not the dynamics of their development. The results are also conditioned by the adopted subject scope (the set of diagnostic variables used) and object scope. The assessment covered only those EU countries for which it was possible to collect a complete set of information. Including additional variables could change the values of the maturity indicator and affect the ranking presented in the article.

The limitations identified indicate directions for further research, including in particular a sensitivity analysis of the results with respect to the selection of variables and the weighting system, as well as extending the study to include a dynamic perspective. Research on the evolution of the maturity of housing loan markets in individual countries could constitute a development of the approach presented in the article.

CONCLUSION

The findings of the study support the hypothesis that the degree of maturity of residential mortgage markets across the European Union countries varies considerably. The application of the authors' original framework, based on seven evaluation criteria and nine diagnostic indicators, together with the use of the TOPSIS method, made it possible to conduct a synthetic assessment of the analysed markets and to rank them according to their relative proximity to the ideal model of a mature market and their distance from the anti-ideal solution. At the same time, the study confirms the usefulness of multicriteria methods in analysing complex processes taking place in financial markets.

The analysis reveals a clear segmentation of European residential mortgage markets in terms of the criteria and indicators adopted in the study. The highest-ranked positions are occupied by the countries of Northern and Western Europe, which are characterised by substantial market depth, well-developed refinancing mechanisms based on covered bonds, relatively stable pricing conditions, and a significant share of fixed-rate mortgage lending. This pattern of results indicates that the maturity of residential mortgage markets depends not only on the level of outstanding mortgage debt but also on the sustainability of funding sources, the degree of capital market development, and the capacity of the financial system to manage long-term risk.

The countries of Central and Eastern Europe are concentrated in the lower part of the ranking. This is attributable primarily to the smaller scale of their residential mortgage markets, the weaker integration of mortgage finance with capital markets, and less developed mechanisms for mitigating interest rate risk. These findings demonstrate that the convergence of housing finance models within the European Union remains incomplete and that institutional and historical differences continue to exert a significant influence on the level of development of individual mortgage markets.

The results further highlight the importance of the interest rate structure of residential mortgage loans as one of the key dimensions of market maturity. Both the literature review and the comparative analysis indicate that a higher share of fixed-rate mortgages is characteristic of more developed financial systems possessing the institutional and market infrastructure necessary for the effective management of interest rate risk. This suggests that the development of residential mortgage markets should be assessed not only in terms of their size but also with regard to the quality of mortgage products offered, the stability of funding sources, and the degree of protection afforded to borrowers against macroeconomic shocks.

At the same time, several limitations of the study should be acknowledged. The proposed synthetic maturity index is relative in nature and depends on the selected group of countries, the choice of diagnostic indicators, and the normalisation procedure employed. Consequently, the resulting ranking should not be interpreted as an absolute classification of the level of development of residential mortgage markets. Furthermore, some of the indicators used, particularly those reflecting market size, may capture not only the degree of market maturity but also the consequences of previous phases of rapid credit expansion or high levels of household indebtedness. Therefore, the results should primarily be regarded as a comparative analytical tool rather than as an absolute measure of market development.

Future research should examine the robustness of the ranking through the application of alternative sets of diagnostic indicators. Another promising direction for further research would be to identify and analyse the development trajectories of individual residential mortgage markets.

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