An Alternative for Future Lending: Income-Linked Repayments*

Zsombor Incze

The study presents the most typical domestic and international trends in mortgage lending models and product development through a literature review of their historical evolution. It concludes that innovations concerning the basic structure of mortgage loan products have not spread in the Hungarian market, although recent academic literature has proposed such developments. Building on one of these academic innovations, a mortgage product based on income variation over the career cycle is developed. This product is examined through the Hungarian medical wage scale and the Magyar Nemzeti Bank's housing affordability methodology. The findings suggest that, with timely and forward-looking financial planning, a household consisting of early-career physicians could potentially afford to purchase a home, suitable for raising children, as their first property.

Journal of Economic Literature (JEL) codes: G20, G21, G50, G51

Keywords: mortgage loan, career cycle, instalment, house purchase, housing affordability

1. Introduction

Housing affordability is a serious social problem worldwide, and Hungary is no exception. According to data from the Magyar Nemzeti Bank (the central bank of Hungary, MNB), in Budapest, purchasing a *first home* for a childless household is typically only possible with considerable financial tightness, and the same is true for rural economic centres (*MNB 2024a*).

Therefore, this study draws on international examples and results from Hungarian literature to construct a loan scheme that takes into account the borrower's *initial* status not only in terms of dwelling size, but also in terms of career: the fact that their income is expected to increase in real terms over the years.

---

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

Zsombor Incze: University of Miskolc, PhD Student; OTP Bank Retail Division, Employee.
Email: zsombor.incze@incze.hu

The first version of the Hungarian manuscript was received on 11 April 2025.

DOI: https://doi.org/10.33893/FER.24.3.95

The impact of the scheme on the affordability of house prices is examined using the medical wage scale and the MNB HAI (Housing Affordability Index) methodology, after which the results are summarised and further research opportunities are suggested.

One limitation of the analysis is that how such a scheme would fit into the current Hungarian legal environment is not analysed. The aim of the study is to highlight how powerful it is in itself to go beyond the narrow limits of annuity mortgages – as many other countries do – and to assess the social relevance of the scheme.

2. Overview of mortgage lending and mortgage loan products

Presenting a brief historical overview of mortgage lending, this section summarises the operational models of mortgage-based financing and the product schemes built on them. A broader analysis of the size and dynamics of the mortgage loan market is beyond the scope of this study.

2.1. A brief historical overview of mortgage lending

2.1.1. International developments

Before the emergence of institutionalised housing financing systems, direct forms of financing (within families or ethnic groups) were the most common. More advanced forms of these were, for example, networks organised by notaries in France or Germany in which the notary's presence and access to databases recording property relations provided a kind of basic guarantee for the lender. However, one fundamental feature was that they financed local housing needs from local capital (*Blackwell – Kohl 2017*). In the Anglo-Saxon countries, deposit-based financing solutions were the first to spread, either in a bank-like or more targeted institutional framework (e.g. building societies). The common feature here was that, due to their decentralised operation and local capital raising, they did not compete for the same capital market resources as mortgage bonds and were therefore better able to support the growth of individual home ownership (*Blackwell – Kohl 2017*).

The foundations of institutional mortgage lending which remain typical in continental Europe to this very day date back to the German *Pfandbrief* (mortgage bond) system in 1769. The German system provided a very stable basis for the development of property-based lending. Modern German mortgage financing was established by the Mortgage Bank Act (Hypothekenbankgesetz, HBG), which came into force on 1 January 1900 (*Quirk 2010*). The foundations were so stable that there has not been a single Pfandbrief default in Germany to date (*VDP 2025*), and many other countries have based their mortgage lending structures on the German one, including Hungary.

The Danish mortgage lending system has a similarly strong history, with the foundations laid in 1797 to finance the need for property investment following the fire in Copenhagen in 1795. The Danish system is based on the "balance principle" (*balanceprincippet*), which means that the credit institution disbursing the mortgage loan must issue a mortgage bond that is precisely tailored to the parameters of the mortgage loan in order to finance the loan. The Danish Mortgage Act was adopted in 1850, regulating the institutional structure established in 1797. Today, Denmark is one of the most developed and complex mortgage markets in the world (*Chong 2010*).

In examining mortgage lending, we cannot ignore securitisation structures in the US (and in some European countries). In contrast to the covered bond solution used in Europe, securitisation means that the mortgage loan does not remain on the balance sheet of the issuing bank, but is transferred as a transferable security to capital market investors seeking to invest their long-term funds. Therefore, from a credit risk point of view, the two asset classes are different: the issuing bank is liable for the mortgage bond even if the mortgage loans default, while in the case of a securitised mortgage loan the investor bears the credit loss (*Bozsik 2002*). The resulting anomalies of interest-based systems (the bank assessing creditworthiness is not interested in the long-term soundness of the loan if it outsources it from its balance sheet) were discussed in more detail by *Marsi* (*2008*), while a comprehensive assessment of the perfected model of securitised mortgage lending ("originate to distribute") was published by *Király – Nagy* (*2008*).

Somewhere between the two systems is the Swiss structure, which is also based on mortgage bonds. The Swiss solution is governed by the 1930 Mortgage Bond Act;[1] therefore, this is also a model with proven stability over a long period. Switzerland uses a so-called *pooling model* to secure long-term funding for mortgage loans. In this model, customers are financed by commercial banks, which refinance customer loans (or a part of them) with long-term collateralised refinancing loans received from mortgage banks (these refinancing loans are collateralised by the individual mortgage loans themselves). Mortgage banks are responsible for raising long-term funds on the capital markets. This model has effectively created *specialised* credit institutions with exceptional operational efficiency: a separate institution responsible for serving borrowers and a separate specialised institution responsible for providing the necessary long-term funding (*Nagy et al. 2020*).

The Swiss pooling model presented by *Nagy et al.* (*2020*) thus represents a real transition between *classical* mortgage banking model in Europe and securitisation, which is mainly overseas:

[1] PfG (1930): *Pfandbriefgesetz*. https://www.fedlex.admin.ch/eli/cc/47/109_113_57/de. Downloaded: 20 March 2025.

- The lender provides the commercial bank with the secure, long-term funds necessary for lending;
- This occurs with appropriate economies of scale (as a smaller bank would not be able to securitise on its own);
- It also incentivises commercial banks to exercise restraint, because although they receive capital market funding, they still essentially bear the credit risk.

2.1.2. Hungarian developments

A comprehensive historical overview of mortgage lending in Hungary is provided by *Kovács* (*2004*). In Hungary, the keeping of a land register, which was absolutely necessary for mortgage lending, became compulsory from 1855 (extended to Transylvania from 1870), and from 1856, the mortgage department of the Austrian National Bank also started to provide mortgage lending. This activity was basically able to meet the credit needs of the aristocracy; therefore, in 1863, the Hungarian Land Credit Institute was established to lend to the broader public, lending its funds acquired through the issuance of mortgage bonds. After the Compromise, the market boomed, with more and more players getting involved in mortgage lending. A correct picture of the prudence of the period is basically provided by the fact that while by 1909, 98 per cent of mortgage loans in Budapest credit institutions were backed by mortgage bonds, the national figure was only around 30 per cent (*Kovács 2004*).

Before the First World War, mortgage-based lending was mainly intended to meet the financing needs of agricultural investments, but in the 1920s the financing of mass housing demand also started. However, one problem in the sale of mortgage bonds was the lack of capital for post-war reconstruction in Hungary and the post-war devaluation of the koruna abroad, which led to mistrust in Hungarian mortgage bonds. To reduce their transaction costs, Hungarian banks therefore raised capital to finance Hungarian lending through cooperatives (somewhat similar to the Swiss pooling model) in previously unused markets (e.g. London), but after the onset of the global economic crisis, foreign fund raising became completely impossible (*Kovács 2004*).

Mortgage lending in Hungary was reinvigorated after the change of regime with the 1997 Mortgage Loan Companies Act[2] and the establishment of mortgage banks.

The early 2000s were defined by interest-subsidised loans. Initially, the state provided interest rate subsidies on the liability side (linked to mortgage bonds) and then on the asset side (directly linked to loans), which was a very generous

[2] Act XXX of 1997 Mortgage Loan Companies and on Mortgage Bonds (Mortgage Loan Companies Act) https://net.jogtar.hu/jogszabaly?docid=99700030.tv. Downloaded: 19 March 2025

scheme; in other words, a substantial transfer to the debtors and banks (see *Papp 2005; Hegedüs – Somogyi 2004*).

Following the reduction in interest subsidies, the industry turned to foreign currency lending. This study does not aim to discuss FX lending in view of the already detailed coverage of the topic. The reasons for the emergence of FX lending were analysed, for example, by *Nyeste – Árokszállási* (*2012*), *Dancsik et al.* (*2019*) and more recently by *Schepp – Pitz* (*2022*). *Kovács* (*2013*) summarised the differences between public beliefs and banking reality, while *Bozsik* (*2009*) and *Király – Nagy* (*2008*), for example, drew attention to the looser management of the associated risks. *Bethlendi* (*2015*) published a summary of the systemic failure resulting from faulty product development, *Dancsik et al.* (*2015*) conducted a comprehensive analysis of non-performing loans and *Bodzási* (*2015*) presented a summary of the changes in the legal framework based on experience.

The 2010s were more about the post-crisis business and regulatory adjustment of the banking sector and less about product innovation. Therefore, the most influential changes in recent years have been the introduction of borrower-based measures in 2015 (*Fáykiss et al. 2018*), the introduction of the Mortgage Funding Adequacy Ratio (MFAR) and the EU mortgage bond regulation (*Nagy et al. 2020*). The latter was primarily intended to address the *mismatch* problem, which is discussed below. These were followed by the digitalisation trends that are still on the agenda (*Becsei et al. 2023*), which are primarily aimed at simplifying the mortgage lending process and thus improving the level of service and customer satisfaction.

2.2. A brief historical overview of the development of mortgage loan products

The history of mortgage loan product development goes back a long way. *Fabozzi – Modigliani* (*1992*) summarised the main development trends and product structures in Chapters 5, 6 and 7 of their book. Although a 33-year-old summary may seem outdated at first glance, we soon realise that in fact the product structures available on the market have not changed much in recent times.

Mortgage loans were not always amortising products: before the Great Depression, balloon schemes were common in the United States, which also meant that the debtor faced a refinancing constraint at maturity. In addition, in some cases, banks could demand payment of the entire outstanding debt before maturity. During the Great Depression, this product scheme proved to be unstable: banks often liquidated their disbursed mortgage loans to cover depositors' withdrawals, which meant that debtors had to find refinancing in the middle of an economic crisis, with no small challenge (*Fabozzi – Modigliani 1992*). The social importance of the problem is reflected by the fact that, in the HOLC (Home Owners' Loan Corporation) scheme, introduced as part of the New Deal in 1933, over 1 million (non-performing

or poorly performing) mortgage loans were purchased from lenders in three years. Borrowers typically received new, more modern, amortising loans in their place, while lenders found themselves in a significantly better position as a result of the programme by cleaning up their balance sheets (*Rose 2011*).

In the 1930s, the annuity housing loan was therefore developed. It was a huge success and contributed greatly to meeting post-war housing and borrowing needs. Later, however, in the 1970s, it reached its structural limits in connection with two problems: *mismatch* and *tilt* (*Fabozzi – Modigliani 1992*).

The *mismatch* problem is basically caused by the fact that institutions providing long-term loans finance these loans with short-term funds. This can result in higher interest rates paid on deposits than interest rates earned on loans in a period of high inflation, when interest rates are also high to manage inflation. As a result, Adjustable-Rate Mortgages (ARMs) were developed in the 1980s and quickly became popular (*Fabozzi – Modigliani 1992*).

Later, adjustable-rate mortgages became more complex products: for example, convertible ARMs (which included an interest rate fixation option) or balloon/reset ARMs, where the financing was provided by the lender for a longer period of time but the interest rate was reset at specific future dates. In a way, these products can be seen as the predecessors of the "interest rate period" and helped both parties to manage interest rate risk (*Fabozzi – Modigliani 1992*).

The *tilt* problem basically means that the real value of the instalments essentially "tilts" towards the beginning of the repayment period (*Alm – Follain 1984*), or, to put it another way, it is the problem caused by the high inflation of the 1970s, i.e. the depreciation of the repayment instalments at the end of the term. For example, assuming 10-per cent inflation, by the end of the twentieth repayment year, the real value of an instalment for a given period is only 15 per cent of its original value. This problem is not solved by variable-rate loans alone, as inflation does not necessarily go "hand in hand" with market interest rates (*Fabozzi – Modigliani 1992*).

This is essentially the basis for the finding of *Kovács – Pásztor* (*2018*) that the amortisation schedule of a mortgage loan is at odds with the life cycle of the borrowing population. To address this, the authors prescribe a mortgage loan scheme constant at present value, which means a lower initial repayment burden for borrowers. *Kovács – Nagy* (*2020*) built on this when they extended the original *Kovács – Pásztor* (*2018*) mathematical model, based on further income-side studies, to create a mortgage loan scheme based on real income growth back-tested by statistical methods over the life cycle.

In the following, we present some specific mortgage loan product schemes [partly based on *Fabozzi – Modigliani* (*1992*) and partly based on own collection], which

are in some way able to address either the mismatch or the tilt problem (and the related life-cycle problem).

- A *Graduated Payment Mortgage* (GPM) offers a gradually increasing instalment model, primarily for young first-time homebuyers where there is a strong expectation by the parties that the borrower's income will improve (*FHA 2025b*). The rate of increase is fixed and, in most cases, spread over five or ten years (after which the instalment remains fixed). The limitation of the product, however, is that only a choice of predetermined repayment plans is available, and no repayment schedule tailored to the needs and individual situation of the borrower is available (*Winkler – Jud 1998*; *Fabozzi – Modigliani 1992*). However, with the high interest rates at the time of its development (1980s–1990s), negative amortisation was a virtual certainty, which did not improve the product's competitiveness. According to *Winkler – Jud* (*1998*), the product's widespread adoption was also hampered by its complexity, which is why they developed a generalised equation for calculating the initial instalment. A notable difference compared to *Kovács – Pásztor* (*2018*) and *Kovács – Nagy* (*2020*) is that while the repayment plans available in a GPM calculate a maximum instalment increase of ten years, in the latter case, the instalment increases over the entire term. In the case of GPMs, the increase is also not linked to any external circumstance (e.g. inflation or changes in life-cycle income), but is based on the pre-contracted repayment schedule.

- A *Growing Equity Mortgage* (GEM) offers a fixed interest rate and continuously increasing instalments, thus allowing a faster amortisation (*Fabozzi – Modigliani 1992*). This product is similar in nature to *Kovács – Nagy* (*2020*)'s model based on life-cycle income change, in that debtors pay increasing instalments according to a predetermined schedule, with the aim of repaying the mortgage loan earlier than the original 30 years. The main difference is that while *Kovács – Nagy* (*2020*) defined a generalised increase in instalments derived from a long-term statistical data analysis, in a typical US FHA (Federal Housing Administration) Section 245(a) GEM (*FHA 2025a*), the debtor can choose between predetermined repayment increase rates at the time of taking out the loan, and the increase does not last until the end of the term but only for a specific initial period. *Lessambo* (*2013*) also points out that one of the main differences between GEMs and GPMs is that while in the case of GPMs debt service starts with reduced instalments, in the case of GEMs, it starts with full instalments, which will then increase in a predetermined manner.

- A *Shared Appreciation Mortgage* (SAM) combines a traditional annuity mortgage loan with the transfer of a portion of the yield from the appreciation of the property to the lender. The actual payment can be made when the property used as collateral is sold or when the mortgage loan matures (typically 30 years after the loan was taken out). *Iezman* (*1981*) gave a detailed overview of the product,

while *Dougherty et al.* (*1982*) presented the challenges of product pricing in detail. *Fabozzi – Modigliani* (*1992*) argue that it has not been widely adopted because of its overly complex product design. One of its advantages was that it could have provided financing to a wider range of lower-income debtors in an extremely high interest rate environment, as the product could have had a lower interest rate, even zero (*Sanders – Slawson 2005*). It was very popular in the United Kingdom in the second half of the 1990s, and for a short period, there was even a version of the product (with a maximum loan-to-value ratio (LTV) of 25 per cent) that had no payment obligation until the sale of the property used as collateral or the death of the borrower (*Sanders – Slawson 2005*). This product was an interesting innovation, from a mortality point of view, on the borderline of banking and insurance operation. SAMs have subsequently been reinterpreted; for example, *Greenwald et al.* (*2021*) redefined them as housing loans with instalments linked to a house price index.

- The product design of the *Price-Level-Adjusted Mortgage* (PLAM) is essentially designed to ensure the real value of the loan, with monthly instalments fixed in real terms rather than in nominal terms (*Leeds 1993; Fabozzi – Modigliani 1992*). However, the problem was that the principal amount was also indexed, which, although it dealt with the tilt problem, in practice increased the principal balance for a very long time because of negative amortisation: In the example of *Fabozzi – Modigliani* (*1992*), for a 30-year mortgage loan with an initial interest rate of 4 per cent, the instalments rose to over 500 per cent in nominal terms and the negative amortisation at the beginning doubled the principal balance by year 15. *Kovács – Pásztor* (*2018*) makes the instalments constant only in real terms; therefore, it differs substantially from the above model.

- *Swedish mortgage loans*, where once a certain LTV level has been reached, it is up to the debtor to decide whether or not to reduce the principal balance. An overview of the presentation of the Swedish model and an assessment of the regulatory steps taken to reduce the challenges is provided in *Hull* (*2017*). In such a model, the principal repayment instalments are paid entirely according to the borrower's ability to repay, taking into account their willingness to take risks; thus, the life-cycle problem raised by *Kovács – Pásztor* (*2018*) can be freely addressed.

- *Swiss indirect repayment* and *interest-only mortgage loans*: The idea is that instead of amortising the debt, the borrower pays the principal repayment of the loan into a special pension savings account, which the bank can use to recover the debt in the event of default. In essence, the loan becomes an interest-only loan until the debtor retires, at which point the pension savings can be used to amortise the loan in a lump sum, if necessary. The product is described in more detail, for example, by *Bélanger* (*2012*) and *Bourassa – Hoesli* (*2010*). In the Swiss mortgage loan market, interest-only loans are not uncommon, and since the

timing of any principal repayment instalments is left to the debtor, they also have the related advantages of Swedish mortgage loans. However, through the possibility of indirect repayment, the benefits are complemented by the fact that borrowers are also given a tax-efficient savings option to invest the amounts not paid on instalments. Indirect repayment (combined with investment) combination loans were also popular in Hungary before the 2008 crisis, but given the inherent flaws in the Hungarian version of the product (*Bethlendi 2015*), they have since fallen out of the focus of stakeholders' interest.

In the Hungarian market, considerably simpler loan schemes than the above are only available to the mass of household customers: either variable or fixed interest rate, but otherwise *traditional* annuity mortgage loans with full amortisation. The history of Hungarian household mortgage lending over the past 20–25 years has therefore been dominated by product developments within a simple annuity framework, such as:

- *Foreign currency (based) mortgage loans*. These loans are not presented at the product level, as a brief literature review is provided in the previous section.
- *Innovations for consumer protection*, notably the Certified Consumer-friendly Housing Loans (CCHL) framework developed by the Magyar Nemzeti Bank. CCHL loans were presented by *Parragh – Végh* (*2018*) as an initiative to reduce information asymmetry in cooperation between the state and the market. Studies on the speed of interest rate transmission measured through CCHL loans were carried out by *Hajnal – Lados* (*2022*).
- A notable exception to the above is the *equalisation loan* product scheme, where the amount of deposits held with the bank reduces the amount of the underlying loan debt and, in this sense, deviates the product from the normal annuity path through a shortening of the maturity (*MBH 2025*). The product, which is unique on the market, was developed by Budapest Bank and was added to MBH's product range through the merger of Bankholding.

At the product level, the current direction of development is green loans, for which the preferential capital requirement programme provided by the MNB, is one of the drivers (*Kim et al. 2024*), while on the financing (liability) side of products, green mortgage bonds are leading the way (*Nagy et al. 2021*). The MNB has also eased the LTV and DTI rules for the green loan purpose from January 2025 (LTV: max. 90 per cent; DTI (debt-to-income ratio): max. 60 per cent).

Overall, it can be seen that the products available on the Hungarian market rarely offer innovations in product scheme that affect basic repayment parameters. Meanwhile, however, as *Kovács – Pásztor* (*2018*) and *Kovács – Nagy* (*2020*) point out, the "life-cycle-ignoring" nature of mortgage loans remains and burdens

borrowers. A typical housing loan has fixed instalments, which means that over the 15–30-year term of a mortgage loan, instalments fall significantly in real terms. However, in many typical home purchase situations (e.g. moving out of the parents' home/rented accommodation, starting a family), loans are taken out by young people who are at the beginning of their life or career path and therefore do not have sufficient income to finance the purchase of a property that can realistically serve as their long-term home. In practice, this (may) result in multiple moves, which entail considerable financial and human costs (social/family relations, children's integration into new communities, etc.).

In the current study, the *Kovács – Nagy* (*2020*) life-cycle-income-based mortgage loan model is used as a basis and built upon to describe the career-cycle-income-based mortgage loan model. Although this model does not address the need to move due to a lack of own funds, it can help in cases where own funds are available, but the ability to repay is not yet due to the specificities of the career cycle.

3. Career-cycle mortgage loan instalment

Within the framework of the career-cycle approach, employees' earnings trajectories are characterised by real wage increases that predominantly occur at discrete transition points between successive career stages, while in the intervening periods real wages remain essentially constant. Consequently, the 1-per cent lifetime real wage growth documented by *Kovács – Nagy* (*2020*) is not a steady 1 per cent, but can be higher than 1 per cent in some years and 0 per cent in most years. In this section, this is illustrated by further developing the model elaborated by *Kovács – Nagy* (*2020*).

3.1. Career path matrix

In order to differentiate borrowers on the basis of career-cycle characteristics, it is essential to identify the set of possible career trajectories. Once these trajectories are known or can be reasonably estimated, it becomes feasible to calibrate loan repayment schedules so that they are consistently aligned with borrowers' career-cycle income patterns. The starting point is as follows: each career trajectory can be represented as a vector (a one-dimensional data array), where the *t*-th element denotes the income adjustment realised at time *t*. From this representation, we derive equation (1), in which the elements of vector *K* correspond to the income changes indexed by *j* at time *t*.

$$\overline{K} = (j_1; j_2; \dots j_t) \tag{1}$$

The vector *K* can be written for each career path (of number *i*). This gives us the matrix *K* of career paths.

$$K = \begin{pmatrix} j_{1,1} & \cdots & j_{1,t} \\ \vdots & \ddots & \vdots \\ j_{i,1} & \cdots & j_{i,t} \end{pmatrix} \tag{2}$$

Row *i* of the matrix *K* contains the income changes associated with the i^{th} career path, while each column *t* contains the income changes associated with time *t*.

Thinking further in this framework, a borrower can be given a *personalised* instalment, which depends on their profession, the years they have already spent in it (since not everyone starts at *t*=1, i.e. at the beginning of their career, when taking out a loan) and the chosen maturity (i.e. how many years to take into account the values for their profession).

(1) To implement this, two tasks must be accomplished: the matrix *K* must be populated with the appropriate values for each profession *i* and each career period *t*;

(2) Using the elements of the *K* matrix, repayment schedules must be derived for individual borrowers, thereby determining the complete amortisation profile of the mortgage loan.

Therefore, computation of the mortgage amortisation schedule requires extracting the relevant element from the career-path matrix for each year and using it to adjust the repayment amount. This mechanism results either in accelerated repayment or, alternatively, in a higher effective loan principal for a given maturity.

The study assumes the latter, since the social objective mentioned in the introduction – fewer moves and lower related transaction costs in the broad sense – is best achieved by enabling the disbursement of larger loan amounts. One limitation of the model is that it does not in itself account for the career-path income of different professions, which can be estimated in the different ways. As a simple parameter, for a given profession *i*, it expects the rate of income growth expected after *t* years in the profession. While this approach permits the incorporation of sector-specific or geographically differentiated earnings trajectories (since any number of professions *i* can be defined, thereby allowing workers with identical occupations in different industries or locations to be modelled separately), it remains silent on the estimation uncertainty surrounding these parameters.

3.2. Sample calculation based on the medical wage scale

In the example calculation, the aim is to show how much more borrowing would be possible for profession *i* if borrowers increased their instalments by $j_{i,t}$ at time *t* in line with the expected increase in their income. It is important to note that the medical wage scale does not mention the automatic indexation of medical wages by inflation, which is why in this example calculation the inflation parameter of the model (by which we increase the instalment to be constant in real terms) is taken to be 0.

The wage scale defined in the Medical Wages Act[3] provides a simple example calculation to demonstrate the power of the model. The simplicity of the example is that the rate of increase in the medical wage scale depends primarily on the number of years in the profession; therefore, it provides an excellent illustrative basis. The medical wage scale is presented in *Table 1*.

Table 1
Medical wage scale from 1 January 2023

	A)	B)
	Time in practice (years)	**Amount (HUF)**
1	0–2	687,837
2	3–5	875,906
3	6–10	1,231,212
4	11–15	1,399,247
5	16–20	1,491,679
6	21–25	1,655,653
7	26–30	1,794,715
8	31–35	1,868,567
9	36–40	2,025,667
10	41–	2,380,057

Source: Annex 1 of Act C of 2020

The *i*=medical profession row of the matrix *K* can be defined based on the medical wage scale and is called the K_M vector for the sake of simplicity. Loading the vector K_M for a 20-year maturity for the example calculation, the change in a junior doctor's income according to the wage scale is given in equation (3).

$$\overline{K_O} = (0\%; 0\%; 0\%; 27\%; 0\%; 0\%; 41\%; 0\%; 0\%; 0\%; 0\%; 14\%; 0\%; 0\%; 0\%; 0\%; 7\%; 0\%; 0\%; 0\%) \quad (3)$$

[3] Act C of 2020

Using the K_M vector, *Table 2* shows the evolution of instalments for a HUF 1 million mortgage loan with a 20-year maturity and a 5-per cent interest rate taken out by a junior doctor. For the sake of simplicity, the unit of time was taken to be 1 year (the example would still be applicable if broken down into months, but then in the case of the vector K_M, t would not refer to an annual but a monthly breakdown). How much loan can be taken out in the case of a traditional annuity mortgage loan is also presented.

The example calculation was performed as follows:

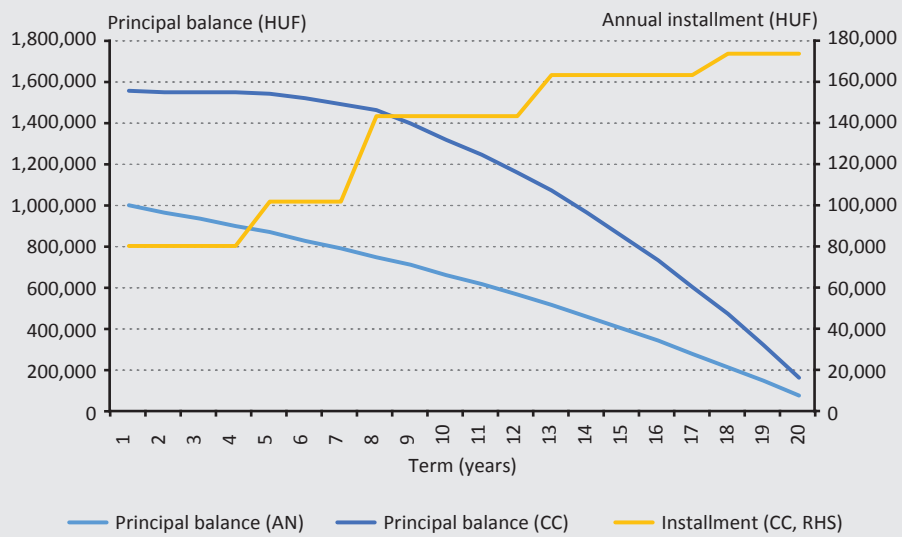
(1) the instalment of a conventional fixed interest rate annuity loan is calculated;

(2) the loan instalment in each period is increased by the amount of the increase allowed by the K_M vector (also transposed the K_M row vector to the K_M column vector);

(3) the instalments for the relevant period are discounted at the nominal interest rate;

(4) and by summing up the discounted instalments, the amount of the loan that could be taken out in the career-cycle mortgage loan scheme is obtained.

Figure 1
Principal maturity of career-cycle and annuity loans with identical initial instalments and the size of the CC loan instalments (annual data)



Note: career cycle: CC, annuity: AN

In *Figure 1*, it can be observed that the specific mortgage loan modelled has a slower start compared to the annuity loan and then a much steeper decline in principal maturity due to the increase in instalments, starting from around year 7–8.

The adjective "*specific"* should be highlighted: As each borrower is at a different point in their career, the expected timing of their income growth is different. Thus, however illustrative the study's example calculated based on the medical wage scale is, in reality, each career-cycle loan will have different principal maturity characteristics, as will its variation from a standard annuity loan, depending on the expected changes in income over the borrower's career.

Table 2
Maturity tables for annuity and career-cycle loan products

Year	Annuity			Career cycle			
	Repayment (HUF)	Principal amount (HUF)	Interest (HUF)	Increase (per cent)	Repayment (HUF)	Principal amount (HUF)	Interest (HUF)
1	80,243	30,243	50,000	0	80,243	2,458	77,785
2	80,243	31,755	48,488	0	80,243	2,581	77,662
3	80,243	33,342	46,900	0	80,243	2,710	77,533
4	80,243	35,010	45,233	27	80,243	2,845	77,397
5	80,243	36,760	43,483	0	102,183	24,927	77,255
6	80,243	38,598	41,645	0	102,183	26,174	76,009
7	80,243	40,528	39,715	41	102,183	27,483	74,700
8	80,243	42,554	37,688	0	143,632	70,306	73,326
9	80,243	44,682	35,561	0	143,632	73,822	69,811
10	80,243	46,916	33,326	0	143,632	77,513	66,120
11	80,243	49,262	30,981	0	143,632	81,388	62,244
12	80,243	51,725	28,518	14	143,632	85,458	58,174
13	80,243	54,311	25,931	0	163,235	109,334	53,902
14	80,243	57,027	23,216	0	163,235	114,800	48,435
15	80,243	59,878	20,364	0	163,235	120,540	42,695
16	80,243	62,872	17,370	0	163,235	126,567	36,668
17	80,243	66,016	14,227	7	163,235	132,896	30,340
18	80,243	69,317	10,926	0	174,018	150,323	23,695
19	80,243	72,782	7,460	0	174,018	157,840	16,179
20	80,243	76,422	3,821	0	174,018	165,732	8,287
	Total	**1,000,000**			**Total**	**1,555,696**	

Note: t=20 years, k=5 per cent, i=0 per cent

Several lessons can be drawn from *Table 2.* On the one hand, the career-cycle-based amortisation schedule is a very powerful instrument, as it allows for an initial contract size more than 50 per cent higher when aligned to the starting point of the medical wage scale, while leaving all other conditions unchanged.

On the other hand, it is also sensitive to changes in income, since in the initial period, only about 3 per cent of instalments are made in principal repayment instalments (the rest in interest), and only in year 9, after two significant increases in income, do principal repayment instalments become larger than interest repayment instalments. Meanwhile, the total amount of the instalment (interest + principal) increases by 117 per cent compared to the initial value.

3.3. Sensitivity testing of the model

Several sensitivity tests were conducted in the model, using the vector *K* on the medical wage scale and a 20-year maturity as an example and a loan of HUF 1 million for a normal annuity scheme as a basis. *Figures 2* and *3* show the evolution of the initial annual amortisation and the available loan amount for the career-cycle scheme on the vector *K* in different interest rate scenarios.

Figure 2
Effect of interest rate on the initial annual amortisation

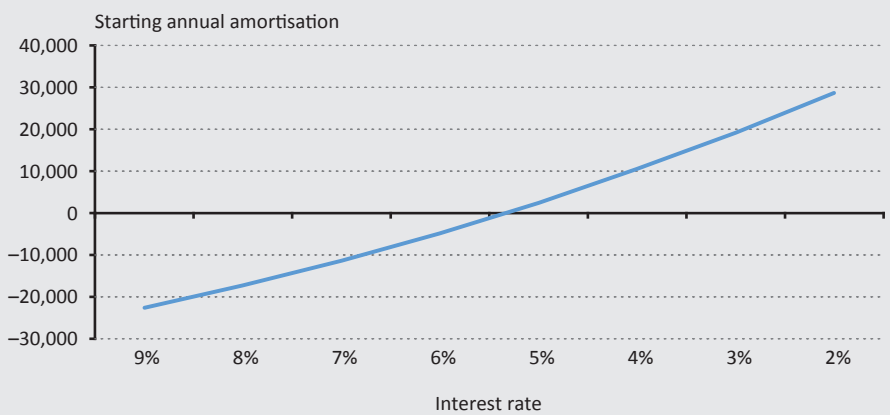
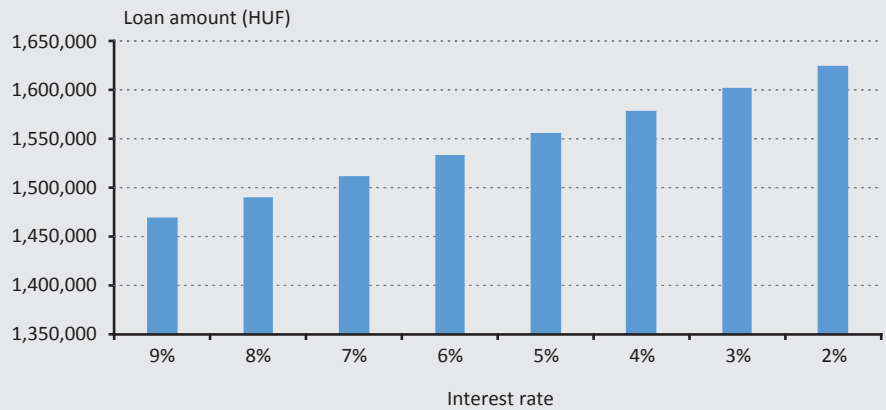


Figure 3
Effect of interest rate on the available loan amount



It is easy to see that the scheme is highly sensitive to the rate of interest. At an interest rate higher than about 5.3 per cent, negative amortisation appears in the initial years and the debt service paid is not even sufficient for interest.

It can also be seen that the interest rate has a significant impact on the size of the loan available. The reason for this perhaps non-trivial relationship is that the debt service rate (annual amount of principal and interest payments) is fixed in the model, adjusted to the borrower's income path (vector *K*). This is why the maximum value of the loan amount has to adapt: if the interest rate is higher, the amortisation is negative and will need to be compensated for later – but this is only possible with a lower loan amount, due to the fixed debt service. The difference (between the largest and the smallest loan amount) is not small, in the range of 2 to 9 per cent, and is in the order of 10 per cent.

However, it is also important to underline the limitations of the sensitivity analysis: this particular example can only be applied to the specific case for which it was calculated. Each borrower's calculated income path is different, resulting in different interest rate sensitivities.

3.4. The impact of career-cycle mortgage loans on housing affordability

Housing affordability is fundamentally a social, sociological issue rather than a narrow banking or financial one. In Hungary, the housing system, its affordability, what kind of housing we live in and how much we pay for it have been and are being investigated by numerous researchers, including, for example, *Nagy* (*2023*)*, Hegedüs – Székely* (*2022*)*, Hegedüs* (*2021*)*, Dóra et al.* (*2018*) and many others. The MNB has also been calculating the Housing Affordability Index (HAI) since the first publication of the Housing Market Reports (*MNB 2020*). According to the MNB's definition, the HAI shows how many times the income needed for a specific dwelling size is available to a two-earner household, where both earners have average earnings, if they borrow in accordance with specific parameters. According to the MNB's definition, the parameters are as follows: LTV=70 per cent, DTI=30 per cent and maturity = 15 years.

According to the MNB's latest Housing Market Report (*MNB 2024a*), housing affordability has been on an improving trend recently, especially among those eligible for state-subsidised (family subsidies) loans. The MNB calculates two indicators (national and Budapest HAI) and several sub-indices of these according to the number of children, the size of the dwelling required in relation to the number of children and the different conditions of family subsidies. It is interesting to note that although Budapest has the highest house prices, the affordability of housing in Budapest is basically significantly better than what the national HAIs show. A HAI indicator below 1 indicates financial tightness, while a value above 1 indicates buying a home with a loan without financial tightness. The MNB assumes a dwelling size of 45 m^2 for a two-earner household without children and 65 m^2 for a two-earner family with two children (*MNB 2024a*).

In Hungary, it is often argued that measures to support housing market demand primarily stimulate the demand side, while only affecting the supply side to a lesser extent (*Bereczki et al. 2025; Banai et al. 2021*), and accordingly, even a career-cycle loan product would not substantially improve affordability through the adjustment of house prices. Meanwhile, the question arises whether there is a justification and timeliness for a new demand-enhancing measure in parallel with the launch of the Home Start Programme, which offers new home buyers a fixed interest rate housing loan of 3 per cent.

However, a number of important features of a career-cycle mortgage loan add nuance to the picture. First, it provides demand-side assistance without budget support, so that budget resources can be used to address supply-side challenges. Second, it is less transparent from a communication point of view and is in all respects individualised (based on individual career paths); therefore, supply would find it harder to adapt as not all potential buyers would have the same ability to pay. Third, as there is no non-repayable subsidy element, borrowers would also be

more responsible about it, as they would have to repay the full amount – which could also keep prices under pressure.

3.5. Examining housing affordability using the HCSO's Real Estate Data Warehouse

An analysis of housing affordability for Budapest and five rural cities (Debrecen, Szeged, Miskolc, Pécs, Győr) is presented below.

As a starting point, the latest publicly available house price data for 2023 from the HCSO's Real Estate Data Warehouse (*HCSO 2024*)[4] ("Total dwellings"; thus, no distinction was made by type) were used, along with the basic parameters used by the MNB (DTI=30 per cent, LTV=70 per cent, maturity=15 years). However, a (simplifying) assumption is made that the net wage is 2/3 of the gross wage (according to the wage scale). The interest rate chosen for the example calculation is the average interest rate on market-based housing loans at the end of 2023, i.e. 7.3 per cent (*MNB 2023*).

Table 3
Level of house prices, amount of instalments with annuity loans and corresponding HAI values by dwelling size, calculated on the basis of the starting wage according to the medical wage scale

House prices		Annuity loan			
		45-m² flat		65-m² flat	
Settlement	Average m² price (thousand HUF)*	Repayment instalment (thousand HUF/year)	HAI	Repayment instalment (thousand HUF/year)	HAI
Budapest	894	3,151	1.05	4,551	0.73
Debrecen	684	2,411	1.37	3,482	0.95
Szeged	583	2,055	1.61	2,968	1.11
Miskolc	375	1,322	2.50	1,909	1.73
Pécs	521	1,836	1.80	2,652	1.24
Győr	650	2,291	1.44	3,309	1.00

*Note: * HCSO Real Estate Data Warehouse*

Table 3 shows that affordability for a 45-m² small home for a two-earner household in the example is consistently above 1, with the exception of Budapest, where it is not much above 1, which represents financial tightness. However, in the case of families with two children (65-m² dwelling size), affordability is already below level 1 in Budapest and Debrecen (making it financially difficult to buy), while in Győr, it is just below 1, and in Szeged, it is close to 1; therefore, it was considered to be significantly burdensome there as well by the end of 2023.

[4] https://www.ksh.hu/s/ingatlanadattar/adattar?year=2023. Downloaded: 16 March 2025.

Table 4
House prices and the contract size available with a career-cycle loan, the size of the dwelling and the value of the associated initial repayment instalment

Settlement	Average m² price (thousand HUF)*	House price (thousand HUF)	Dwelling size (m²)	Contract size (thousand HUF)	Initial repayment instalment (thousand HUF/year)	HAI
Budapest	894	56,702	63.4	39,691	3,151	1.05
Debrecen	684	43,383	63.4	30,368	2,411	1.37
Szeged	583	36,977	63.4	25,884	2,055	1.61
Miskolc	375	23,784	63.4	16,649	1,322	2.50
Pécs	521	33,044	63.4	23,131	1,836	1.80
Győr	650	41,226	63.4	28,858	2,291	1.44

*Note: * HCSO Real Estate Data Warehouse*

Table 4 shows the strength of the career-cycle mortgage loan. It can clearly be seen that with the same HAI as the one associated with a 45-m² dwelling in a normal annuity loan, the household in the example could have purchased a 63-m² dwelling in 2023 year-end market conditions (assuming that the necessary own funds were available, as the LTV remained the same), which is approximately equivalent to the dwelling size used by the MNB as the basis for the HAI calculation for a family of four (65 m²).

This is an extremely strong claim because, in fact, *Kovács – Nagy* (*2020*) argues that with conscious long-term planning and a larger contract size, it is possible to avoid significant moving costs when taking out a first loan. The figures in *Table 4* provide practical evidence for this claim, for a household with the parameters of the example household, in 2023 year-end market conditions.

4. Challenges and considerations for career-cycle mortgage loans

4.1. Key challenges

Career-cycle mortgage loans face a number of challenges that are critical to the success of the product type.

One basic risk is that most professions are not on a wage scale. Therefore, there may be uncertainty about the increase in income and hence the increase of the instalment. In the case of certain professions or groups, technological upgrades or other reasons may lead to situations where the actual income of the borrower differs from the income level calculated at the time of taking out the loan, even if the profession itself or the market position of the industry changes over the term of the mortgage loan.

It also poses a risk if a borrower's income growth is exceeded by inflation (whether due to industry-specific characteristics or the cyclical nature of the economy as a whole), and it significantly increases the borrower's risk if management career paths are also taken into account in the career matrix, as it often takes longer to find a replacement of a similar level if such a job is lost.

Additionally, rising instalments in line with wage increases impose a natural limit on consumption for borrowers. In the case of families, for example, this can be an obstacle to increased consumption associated with the arrival of children.

The viability of the model and the benefit to borrowers may be affected by the fact that the interest paid over the entire term of the loan is also higher relative to the principal amount for a career-cycle mortgage loan than for a traditional annuity scheme – and depending on the contract size, the difference may even exceed the financial burden of a move in the strict sense.

4.2. Considerations related to the challenges

The career matrix underlying career-cycle mortgage loans allows income changes at each point in time to be estimated with sufficient conservatism. Although the baseline model (*Kovács – Nagy 2020*) assumes a constant repayment instalment in real terms, the career matrix approach provides sufficient flexibility to ensure that constancy in real terms is not a necessary condition.

The main purpose of creating this model was to allow well-planned career paths, such as when a junior administrator becomes an experienced senior administrator (or a junior doctor becomes an experienced doctor), and this experience is generally reflected in their income, to be taken into account in bank credit assessments. It is therefore not the intention to include either managerial career paths or career paths across job families; estimating these is a further research task.

In the case of GPMs and GEMs, which are available in the US and most similar to the scheme, as presented in *Section 2.2*, the FHA – as a public mortgage insurer – provides credit insurance, the premium for which is paid by the borrowers. This is an important distinction from a typical government loan programme in Hungary: the FHA essentially operates on self-generated revenue (*HUD 2025*). The FHA basically offers these products to low- to middle-income customers for home ownership who expect their income to increase significantly in the future and, in the case of GPMs, know that they will pay more interest than they would under a traditional annuity scheme (*FHA 2025b*). In the case of GEMs, the increasing instalments are mainly used for principal repayment; thus, the maturity is reduced (*FHA 2025b*).

In the author's opinion, in line with the example of the FHA, by adding credit insurance – i.e. by spreading the risks arising from specific industries and individual life and career situations across the insurance risk pool – a significant part of the

above risks could be managed and the product itself could be made adequate from a banking perspective, while still not being a significant fiscal burden. Of course, a version of the product similar to the GEM could also be created, which translates higher instalments into shorter maturities.

The impact of a rising repayment burden on consumption (other than housing) as income rises is certainly a phenomenon, but I would highlight the finding of *Kovács – Pásztor* (*2018*) that the current amortisation schedule is at odds with the life cycle of households: it imposes a high burden when borrowers' income is lower and a lower (even lower in real terms) burden when income is higher. In the author's opinion, the increasing consumption needs of a family with the arrival of children are, on the whole, better supported by a lower initial instalment (this is the logic behind the suspension of the repayment of the prenatal baby support loan upon the birth of a child), but the fact is that in the later years, with the debt no longer increasing the household budget, the household can no longer choose to increase its consumption for housing purposes at the expense of other aspects of family maintenance.

The financial benefits of the model need to be carefully considered, due to the higher amount of interest paid. However, in addition to the direct cost of moving, the human costs mentioned earlier need to be taken into account, and it is worth considering alternatives (e.g. moving from rented property to own, which in some life situations would not be feasible with a traditional annuity loan, but may be feasible with a career-cycle mortgage loan). A career-cycle loan also allows for more leverage in the first period compared to an annuity loan (larger contract size for any LTV means higher loan-financed housing market exposure), which tends to increase household wealth in a growing housing market – of course, the opposite is true in a declining market.

5. Summary and further research opportunities

This paper reviews the operation of Hungarian and North Atlantic mortgage finance models through a literature review. It was found that, despite numerous – sometimes problematic – innovations, the Hungarian mortgage market has never afforded borrowers the same degree of choice as several other mortgage markets, including those within the European Union. Therefore, the presentation of mortgage products with either constant real repayments or repayments indexed to life-cycle income growth, both of which are primarily designed to improve housing affordability and access to homeownership, represents an important contribution in the domestic literature.

Building on these results, a career-cycle income-based mortgage framework was elaborated. The core of the model is the representation of income changes occurring

along a career path as a vector, which, when aggregated across professions, yields a matrix. Based on this structure, a repayment schedule was constructed based on the assumption that the ratio of repayments to income remains constant, so that rising income over time translates into increasing repayment capacity. When back-calculated, this implies a substantially higher borrowing capacity.

In a numerical illustration, the model was applied to the tenure-dependent wage scales of the medical profession. In this scheme, and given the assumed interest rate and maturity, an entry-level physician would be able to borrow more than 50 per cent more than the initial loan amount available through a conventional annuity loan with identical terms.

The example calculation (also based on the medical wage scale) was carried out for Budapest and five Hungarian cities, in order to show the impact of the loan scheme on affordability through the housing affordability index of the MNB Housing Market Report. The results indicate that, at a given affordability ratio, households of entry-level physicians could purchase significantly larger dwellings, in fact sufficient to meet the MNB's benchmark housing requirement for a four-person household. This outcome supports the argument of *Kovács – Nagy* (*2020*), as at least one residential move (and the associated transaction costs) could be avoided by such households.

The product raises fundamental regulatory-prudential concerns, as it requires the inclusion of an increase in income that can only be expected to occur in the future. In this form, it is obviously incompatible with the current Hungarian regulatory environment. Its popularity may also be affected by the fact that total interest payments over the life of the loan are higher than with a traditional annuity structure.

Nonetheless, evidence from the United States demonstrates that there are mortgage insurance schemes –operating even without direct government subsidies – that enable products with increasing repayment schedules to remain viable and beneficial in advanced regulatory environments. It is therefore likely that a career-cycle-based mortgage would also require such insurance support.

The topic opens up many more research opportunities. First, in order to obtain a more comprehensive picture of the possible market effects, it is essential to examine the scheme using a broader database than the medical wage scale. This even allows for the examination of regional differences, as the income gains achieved on a career path are not necessarily the same in all regions of the country.

Moreover, further future research should be based on a comprehensive examination of the bank profitability, risk management aspects and capital requirements of the career-cycle mortgage lending model, as these aspects were not addressed in the present analysis. The creation of a variable interest rate scheme may also be worth

considering. Examination of the institutional and legal background required for the implementation of the product is also relevant, which, based on international experience, seems to be a prerequisite for complex loan products such as this. Finally, it would be valuable to investigate whether career-cycle-based mortgages could generate broader social effects, such as bypassing the "starter home" stage, that may in turn influence housing supply dynamics.

References

Alm, J. – Follain, J.R. (1984): *Alternative mortgage instruments, the tilt problem, and consumer welfare*. Journal of Financial and Quantitative Analysis, 19(1): 113–126. https://doi.org/10.2307/2331005

Banai, Á. – Fábián, G. – Hajnal, G. – Nagy, T. – Winkler, S. (2021): *Növekvő lakásárak Magyarországon – okok és következmények* (*Rising housing prices in Hungary – causes and consequences*). In: Salamin, G. – Tóth, B. (eds.): Az urbanisztika aktuális kérdései (*Current issues in urban planning*). Magyar Urbanisztikai Társaság, Budapest.

Becsei, A. – Csányi, P. – Bógyi, A. – Máriás, E. – Gacsal, M. – Kovács, L. (2023): *Digital citizenship, digital banking – Digitalization proposals by the Hungarian Banking Association – From basic banking services to mortgage loans, or how to apply for a mortgage loan in 15 minutes instead of 15 days.* Economy and Finance, 10(4): 369–403. https://doi.org/10.33908/EF.2023.4.4

Bélanger, P. (2012): *Assessment of fixed rate mortgage implied insurance cost: Method and ex-post Swiss market analysis.* No. eres2012–372, European Real Estate Society (ERES). https://eres.architexturez.net/system/files/pdf/eres2012_372.content.pdf

Bereczki, Á. – Lados, C. – Szabó, B. – Winkler, S. (2025): *A 2014-et követő évtized lakáspiaci árváltozásának mozgatórugói* (*Drivers of Housing Price Changes in the Decade After 2014*). KAPOCS, 2025(1–2): 60. https://doi.org/10.63582/KAPOCS.2025.1-2.5

Bethlendi, A. (2015): *Bad product development results in systemic market failure – Foreign currency mortgage loans to Hungarian households*. Financial and Economic Review, 14(1): 5–30. https://hitelintezetiszemle.mnb.hu/en/1-bethlendi-en

Blackwell, T. – Kohl, S. (2017): *The origins of national housing finance systems: a comparative investigation into historical variations in mortgage finance regimes*. Review of International Political Economy, 25(1): 49–74. https://doi.org/10.1080/09692290.2017.1403358

Bodzási, B. (2015): *A devizahitelezés korszaka Magyarországon* (*The era of foreign currency lending in Hungary*). Fontes Iuris, 1(1): 7–17. http://real.mtak.hu/25520/1/A_devizahitelezes_korszaka_Magyarorszagon_u.pdf

Bourassa, S.C. – Hoesli, M. (2010): *Why do the Swiss rent?*. The Journal of Real Estate Finance and Economics, 40(3): 286–309. https://doi.org/10.1007/s11146-008-9140-4

Bozsik, S. (2002): *A lakáshitelezés és egyes makroökonómiai változók kapcsolata nemzetközi összehasonlításban* (*The relationship between housing lending and certain macroeconomic variables in international comparison*). Hitelintézeti Szemle, 1(3): 32–49. https://www.bankszovetseg.hu/Content/Hitelintezeti/023Bozsik.pdf

Bozsik, S. (2009): *A magyar bankrendszer válságtűrő képessége* (*Crisis resilience of the Hungarian banking system*). Észak-magyarországi Stratégiai Füzetek, 6(2): 46–67. https://epa.oszk.hu/05300/05359/00011/pdf/EPA05359_strat_2009_02_046-067.pdf

Chong, J.H.W.C. (2010): *Danish Mortgage Regulations – Structure, Evolution, and Crisis Management*. 9 Wash. U. Global Studies Law Review. 9(2), 371. https://openscholarship.wustl.edu/law_globalstudies/vol9/iss2/7

Dancsik, B. – Fábián, G. – Fellner, Z. – Horváth, G. – Lang, P. – Nagy, G. – Oláh, Z. – Winkler, S. (2015): *A nemteljesítő lakossági jelzáloghitel-portfólió átfogó elemzése mikroszintű adatok segítségével* (*Comprehensive analysis of the non-performing residential mortgage portfolio using micro-level data*). MNB-tanulmányok különszám, Magyar Nemzeti Bank. https://www.mnb.hu/letoltes/mnb-tanulmanyok-kulonszam-a-nemteljesito-lakossagi-jelzaloghitel-portfolio-atfogo-elemzese.pdf

Dancsik, B. – Fábián, G. – Fellner, Z. (2019): *A devizahitelezés kialakulásának körülményei – okok és okozatok* (*Circumstances behind the development of foreign currency lending – causes and effects*). In: Bodzási, B. (ed.): Devizahitelezés Magyarországon. A devizahitelezés jogi és közgazdasági elemzése (Foreign currency lending in Hungary. Legal and economic analysis of foreign currency lending). Budapesti Corvinus Egyetem, pp. 111–135. https://unipub.lib.uni-corvinus.hu/4108/1/devizahitelezes2019.pdf#page=112

Dóra, I. – Hegedüs, J. – Horváth, Á. – Sápi, Z. – Somogyi, E. – Székely Gáborné (2018): *Miben élünk? A 2015. évi lakásfelmérés részletes eredményei* (*What do we live in? Detailed results of the 2015 housing survey*). Budapest: Központi Statisztikai Hivatal. https://www.ksh.hu/docs/hun/xftp/idoszaki/pdf/miben_elunk15_2.pdf

Dougherty, A. – Van Order, R. – Villani, K. (1982): *Pricing shared-appreciation mortgages*. Housing Finance Review, 1: 361–375.

Fabozzi, F.J. – Modigliani, F. (1992): *Mortgage and Mortgage-Backed Securities Market*. Harvard Business School Press. Boston, Massachusetts.

Fáykiss, P. – Palicz, A. – Szakács, J. – Zsigó, M. (2018): *Experiences of Debt Cap Regulations in Hungarian Retail Lending.* Financial and Economic Review, 17(1): 34–61. https://doi.org/10.25201/FER.17.1.3461

FHA (2025a): *FHA Growing Equity Mortgages*. Federal Housing Administration. https://www.fha.com/growing_equity. Downloaded: 23 March 2025.

FHA (2025b): *FHA Graduated Payment Mortgages*. Federal Housing Administration. https://www.fha.com/graduated_payment. Downloaded: 10 August 2025.

Greenwald, D.L. – Landvoigt, T. – Van Nieuwerburgh, S. (2021): *Financial Fragility with SAM?*. The Journal of Finance, 76(2): 651–706. https://doi.org/10.1111/jofi.12992

Hajnal, G. – Lados, C. (2022): *Analysis of the Repricing Practice of Newly Disbursed Housing Loans.* Financial and Economic Review, 21(3): 5–43. https://doi.org/10.33893/FER.21.3.5

Hegedüs, J. (2021): *Lakásrendszerek és társadalmi egyenlőtlenségek* (*Housing systems and social inequalities*). In: Köllő, J. (ed.): Kertesi Gábor 70 éves. Írások neki és róla (Gábor Kertesi turns 70. Writings for him and about him). Budapest: MTA KRTK, Közgazdaságtudományi Intézet, pp. 131–144. https://kti.krtk.hu/wp-content/uploads/2024/08/Kertesi-Gabor_70-eves.pdf

Hegedüs, J. – Somogyi, E. (2004): *Lakáshitelezés, támogatási alternatívák és megfizethetőség* (*Housing credit, subsidy alternatives and affordability*). Közgazdasági Szemle (Economic Review), 51(3): 193–217.

Hegedüs, J. – Székely, J. (2022): *Lakásárak, jövedelmek és területi egyenlőtlenségek* (*House prices, incomes and territorial inequalities*). In: Kolosi, T. – Szelényi, I. – Tóth, I.G. (eds.): Társadalmi Riport 2022 (Social Report 2022). Tárki, Budapest.

HUD (2025): *Federal Housing Administration History*. U.S. Department of Housing and Urban Development. https://www.hud.gov/aboutus/fhahistory. Downloaded: 10 August 2025.

Hull, I. (2017): *Amortization requirements and household indebtedness: An application to Swedish-style mortgages*. European Economic Review, 91: 72–88. https://doi.org/10.1016/j.euroecorev.2016.09.011

Iezman, S.L. (1981): *The Shared Appreciation Mortgage and the Shared Equity Program: A Comprehensive Examination of Equity Participation*. Real Property, Probate and Trust Journal, 16(3): 510–545. http://www.jstor.org/stable/20781566

Kim, D. – Raciborski, E. – Várgedő, B. (2024): *Experiences from the MNB's Green Preferential Capital Requirement Programme and the Extension of the Programme.* Financial and Economic Review, 23(3): 193–209. https://hitelintezetiszemle.mnb.hu/en/fer-23-3-fa1-kim-raciborski-vargedo

Király, J. – Nagy, M. (2008): *Jelzálogpiacok válságban: kockázatalapú verseny és tanulságok* (*Mortgage markets in crisis: risk-based competition and lessons learned*). Hitelintézeti Szemle, 7(5): 450–482. https://www.bankszovetseg.hu/Content/Hitelintezeti/HSZ5_kiraly_nagy_450_482.pdf

Kovács, G. (2004): *A jelzáloglevél-kibocsátáson alapuló hitelezés problémái történeti megközelítésben* (*Problems of mortgage-backed lending in a historical perspective*). In: Botos, K. (ed.): Pénzügyek a globalizációban (Finance in globalization). Szeged: JATEPress, pp. 110–136.

Kovács, L. – Nagy, E. (2020): *Életciklus és törlesztőrészlet. A reálértékben állandó törlesztőrészlet és életciklus-jövedelem alkalmazhatósága a lakáshitelezésben* (*Life cycle and monthly repayments: the application of constant real monthly repayments and life-cycle income in the case of housing loans*). Közgazdasági Szemle (Economic Review), 67(10): 1029–1056 http://doi.org/10.18414/KSZ.2020.10.1029

Kovács, L. – Pásztor, S. (2018): *A globális jelzálogpiac helyzete és kihívásai* (*The state of global mortgage markets and the challenges to them*). Közgazdasági Szemle (Economic Review), 65(12): 1225–1256. https://doi.org/10.18414/KSZ.2018.12.1225

Kovács, L. (2013): *A devizahitelek háttere* (*Background of foreign currency loans*). Hitelintézeti Szemle, 12(3): 183–193. https://www.bankszovetseg.hu/Content/Hitelintezeti/183-193-Kovacs.pdf

Leeds, E.M. (1993): *The riskiness of price-level adjusted mortgages*. Review of Business, 15(1), 42.

Lessambo, F. (2013): *Mortgage Markets*. In: The International Banking System: Capital Adequacy, Core Businesses and Risk Management. Palgrave Macmillan, London, pp. 159–167. https://doi.org/10.1007/978-1-137-27513-4_16

Marsi, E. (2008): *Elmélkedés a subprime egyes jelenségeiről*. Hitelintézeti Szemle, 7(5): 483–490. https://www.bankszovetseg.hu/Content/Hitelintezeti/HSZ5_marsi_483_490.pdf

MBH (2025): *Piaci Lakáscélú Hitelek* (*Market Housing Loans*). MBH Bank. https://www.mbhbank.hu/lakossagi/kolcsonok/jelzalog/lakascelu-hitelek. Downloaded: 25 March 2025.

MNB (2020): *Housing Market Report - June 2020*. Magyar Nemzeti Bank. https://www.mnb.hu/letoltes/laka-spiaci-jelente-s-2020-ju-nius-en.pdf

MNB (2023): *Hitelezési Folyamatok 2023 IV. negyedév* (*Lending Processes 2023 Q4*). Magyar Nemzeti Bank. https://www.mnb.hu/letoltes/hitelezesi-folyamatok-flyer-2023-iv-hu.pdf. Downloaded: 12 August 2025.

MNB (2024a): *Housing Market Report – November 2024*. Magyar Nemzeti Bank. https://www.mnb.hu/letoltes/housing-market-report-2024-november.pdf

MNB (2024b): *Az MNB az adósságfék szabályok és a Minősített Fogyasztóbarát keretrendszer módosításával erősíti a zöld hitelezést* (*The MNB strengthens green lending by amending the debt brake rules and the Qualified Consumer-Friendly Framework*). Magyar Nemzeti Bank. https://www.mnb.hu/sajtoszoba/sajtokozlemenyek/2024-evi-sajtokozlemenyek/az-mnb-az-adossagfek-szabalyok-es-a-minositett-fogyasztobarat-keretrendszer-modositasaval-erositi-a-zold-hitelezest. Downloaded: 9 August 2025.

Nagy, E. (2023): *Az én házam, az én váram* (*My house, my castle*). MyBook, Budapest.

Nagy, G.L. – Bozzai, R. – Tóth, I. – Incze, Z. (2021): *Green? Covered bond? Green covered bond!*. Economy and Finance, 8(1): 2–26. https://doi.org/10.33908/EF.2021.1.1

Nagy, G.L. – Incze, Z. – Landgraf, E. (2020): *Mortgage Bank Refinancing – Proposals for Implementation of the European Covered Bond Directive in Hungary.* Financial and Economic Review, 19(3): 102–129. https://doi.org/10.33893/FER.19.3.102129

Nyeste, O. – Árokszállási, Z. (2012): *Devizahitelezés Magyarországon – régiós makrogazdasági, fiskális és monetáris politikai megközelítésben* (*Foreign currency lending in Hungary – from a regional macroeconomic, fiscal and monetary policy perspective*). In: Kovács, L. (ed.): Negyed százados a magyar bankrendszer (The Hungarian banking system is a quarter of a century old). Magyar Bankszövetség, Budapest. https://www.bankszovetseg.hu/Content/Publikaciok/25_eves_a_magyar-bankrendszer_tanulmanykotet_2012.pdf

Papp, M. (2005): *A jelzáloglevél alapú finanszírozás helyzete Magyarországon pénzügyi stabilitási szempontból* (*The situation of mortgage-backed securities financing in Hungary from a financial stability perspective*). MNB Műhelytanulmány 36. Magyar Nemzeti Bank. https://www.mnb.hu/letoltes/mt36.pdf

Parragh, B. – Végh, R. (2018): *Megújuló állam – megújuló tőkepiac* (*Renewable state – renewable capital market*). Polgári Szemle, 14(4–6): 48–78. https://doi.org/10.24307/psz.2018.1205

Quirk, P. (2010): *Cover me: The economy is on fire* (*The German Pfandbrief*). German Law Journal, 11(12): 1323–1346. https://doi.org/10.1017/S2071832200020265

Rose, J.D. (2011): *The incredible HOLC? Mortgage relief during the Great Depression*. Journal of Money, Credit and Banking, 43(6): 1073–1107. https://doi.org/10.1111/j.1538-4616.2011.00418.x

Sanders, A.B. – Slawson, V.C. (2005): *Shared appreciation mortgages: Lessons from the UK*. Journal of Housing Economics, 14(3): 178–193. https://doi.org/10.1016/j.jhe.2005.07.007

Schepp, Z. – Pitz, M. (2022): *Lakossági devizahitelezés Magyarországon: problémafelmérés és a frankhitelek banki árazásának empirikus vizsgálata* (*Retail foreign currency lending in Hungary: problem assessment and empirical study of bank pricing of Swiss franc loans*). PTE KTK Műhelytanulmányok, 2012(1–4). https://journals.lib.pte.hu/index.php/workingpapers/article/view/5941

VDP (2025): *Security.* Verband deutscher Pfandbriefbanken (vdp). https://www.pfandbrief.de/en/security/. Downloaded: 9 August 2025.

Winkler, D. – Jud, D. (1998): *The Graduated-Payment Mortgage: Solving the Initial Payment Enigma*. Journal of Real Estate Practice and Education, 1(1): 67–79. https://doi.org/10.1080/10835547.1998.12091557