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ИССЛЕДОВАНИЕ МИРОВЫХ ИПОТЕЧНЫХ РЫНКОВ

Рост численности населения вызывает к жизни проблему его обеспечения жильем. Одним из инструментов решения этой задачи выступает развитие ипотечных рынков, имеющее несомненные национальные и континентальные особенности. В статье проведен обзор и описание ипотечных рынков Азии, Африки, Европы, Латинской Америки, а также Соединенных Штатов Америки и Китая. Авторами статьи предпринята попытка выявления основных причин возникновения узких мест на ипотечных рынках этих континентов и стран. Показано различие данных причин в разных государствах, имеющиеся здесь сходства. Например, то, что в начальный период погашения хозяйства ипотечного кредита возлагают на домашние хозяйства значительное финансовое бремя.

Ключевые слова: Азия, Африка, Европа, ипотечные рынки, обзор, Китай, Латинская Америка, проблемы и тенденции, Соединенные Штаты Америки

JEL: E43, G21, O18

In our paper, we try to get an insight into the mortgage markets of the various continents and countries of the world. Our main argument is that in general there are fundamental problems with the mortgage policy and we have to reconsider the basic models. With the help of a literature review and most recent data we point to the most problematic areas in Latin America, Africa, Asia and China, the United States and eventually in the European Union. The introductory part paves the way for the second part of our paper in which we offer a brand new solution for the most important problems of the mortgage markets of the world.

When we study the global highlights of the housing and mortgage markets we have to point to the *(i)* overheated home prices is a number of cities but there have been prices decreases as well in some other areas as well. This is because of the government actions to reduce foreign purchases, macro-prudential measure and/or stretched affordability. The regulators have been actively managing markets with the help of tightening and loosening of lending rules. *(ii)* Also we have to highlight that high household debt amplifies risks. Household debt-to-GDP ratios are at or over 100% in a couple of countries (Norway, Denmark, Canada, Australia, Sweden, UK). The economies are more vulnerable to shock with higher household debt and the borrowers are more exposed to downturns.

Owing to affordability constraints and regulatory interventions, household debt growth has decreased in couple of countries. In some other areas the household debt-to-GDP ratios have stabilized while in China and South Korea they have continued to grow. *(iii)* Political uncertainties such as Brexit, a political appointment to oversee Fannie Mae and Freddie Mac, new governments in Latin America also affect housing. *(iv)* There are fears of slower economic growth as China and the Eurozone are slowing. The more powerful US dollar is putting pressure on emerging markets, the core inflation is low in the Eurozone and Japan and they are going to increase the key interest rate in the US. *(v)* There are some other areas where problems could emerge. Material increases will be out of the question because weaker growth and generally slow mortgage rate rises. In the medium term there is a downside pressure from rising rates, fading fiscal stimulus in the US and weaker growth in China partly because of the stubbornly high global debt. Also we have to mention the tightening of the global financial conditions which could worsen the mortgage performance. Finally, it is also important to highlight *(vi)* the mixed impact from rising rates. The pace of mortgage rate rises will be different in the USA, Japan and the Eurozone. The impact is going to depend on whether mortgages have long-term fixed rates and the macroeconomic backdrop. Highly leveraged markets with a larger number of variable-rate loans may face marked deterioration in loan performance in the case of quickly rising rates. Markets with long-term fixed-rate loans (Latin America, France, Belgium, the US, and the Netherlands) may see lenders gradually increase their demand for higher-risk borrower and loan characteristics as their profitability suffers and competition intensifies [1].

An Overview of the World's Mortgage Markets

Latin America

According to the IMF [2] report, in the past few decades lighter financial conditions and favorable exchange ratio indices helped increase demand and raise interest in borrowing in almost all Latin American countries. The only exceptions to this trend were the years of the 2008—2009 global crisis. Mortgage lending showed an exceptional increase in countries such as Chile and Brazil. The growth of the mortgage market was strong in Brazil, where mortgage lending figures have quintupled since 2007, although there is a generally low credit level behind this increase rate, as well as significant housing anomalies.

Mortgage lending in Latin America grew by 14% on an annual average (inflation adjusted) from 2003 to 2014. This showed a larger increase than that of emerging Asian countries, but it was still smaller than the exaggerated growth rates which were observed in Europe before the housing market bubble burst [2]. The expansion of lending in this region was accompanied by high real estate prices and blooming construction. The construction industry currently accounts for about 6% of the GDP. This ratio is higher than those in emerging Asian countries and the similar ratios of European countries. In addition, apartment prices in metropolitan areas have nearly tripled. Not considering the currently significant growth, the expansion of the mortgage market in most Latin American countries (with the refreshing exception of Chile) is modest in international comparison. In the six most open Latin American countries

(Brazil, Chile, Columbia, Mexico, Peru and Uruguay) mortgage loans only reach 7% of the GDP, while in emerging Asian countries they are at over 20%, and in the United States, they exceed 65%. In addition, the better part of Latin American mortgage loans are provided by commercial banks using domestic deposits and only a fraction of these is securitized. This pattern is the exact opposite of that of converging European countries, where the role of financial institutions conducting non-bank activities increased significantly in mortgage lending too during the years before the financial crisis. This was mainly due to large wholesale funding and cross-border funds. While the further deepening of the mortgage market and the entire credit market would be naturally expected in the future, the fast expansion of credit necessitates tighter monitoring in order to successfully avoid the credit market's cyclical boom then burst, which has already hit the region with considerable force in the past.

We can demonstrate that, aside from the fast growth in lending in the past few years, the level of financial intermediation in Latin America (with the exception of Chile) remains under the level of other developing countries, even if we take into account per capita income. This difference clearly demonstrates the region's long history of macroeconomic instability (in which credit market crises and weak institutional structures for creditors and proprietary rights play a significant role) [3]. The modest performance of the mortgage market is what stands behind the relatively low credit/GDP level in Latin America; we already mentioned that mortgage loans amount to only 7% of the GDP, which keeps this region standing under the level of other developing countries [2].

According to some authors [4] in some countries (namely Brazil and Peru) mortgage loans and housing prices increased faster than was the tendency in the past and faster than economic conditions could account for. This is proof that the surge in mortgage loans can be due to factors that are not part of the standard models. In Brazil, for example, a government-supported housing loan program was introduced which bears the name of "My Home, My Life" *(Minha casa, minha vida)* [5].

The growth in mortgage loans in Latin American goes hand in hand with the expansion of the local currency-denominated bond market and the lengthening of the long term yield curve structure (which has even reached 20-30 years in some cases) [6]. Housing prices grew the most in areas where there was an abundance of mortgage loans available. Housing price data from the five countries where this was available showed that the annual average real growth rate in housing prices remained well below that of converging European countries before 2008, although they were somewhat higher than the values in emerging Asian countries[1].

However we do have to note that the increase in the prices of homes primarily shows the expansion of the high-level income segment of people living in urban areas. At the same time, this is the segment, which has the most access to mortgage loans [7]. No immediate problem is demonstrated by the most important available indicators behind this significant growth, however,

[1] We should not however make any serious conclusions from this data as there is only modest data available about the housing market, which makes precise risk estimation difficult in most Latin American countries. Data on the price of housing is only available in six countries and these stretch over quite a short time horizon and only contain data on specific urban areas.

based on previous experience this does not mean that all is satisfactory. There is severe lack of data in the Latin American market. Internal risk models may help in assessing risks and the anomalies of the housing and other credit sectors may be measured through these [8]. According to other factors, vulnerabilities related to the housing market are kept properly at bay. Mortgage loans, which account for roughly 20% of bank loans, continue to represent only a small portion of banks' portfolios. The ratio of non-performing loans is low (about 3% of mortgage loans) and the indebtedness indicators of debtors are at a manageable level: at around 35% of available income. In comparison, this is at 60% in emerging European countries [2].

This short overview shows that mortgage lending is still in its infancy in Latin America. Previously, in order to utilize the advantages of urbanization and to improve the quality of life of the lower urban class, governments in Latin America tried to introduce housing support schemes. Despite the fact that these support schemes actually improved access to housing and moderated its lack thereof, they left a number of open-ended issues [9]. By now, it is also evident that resolving the growing housing problem will only be possible through introducing fundamental changes [2]. It is clear that central resources will not be enough and that private investments are the key to resolving the lack of housing.

Africa

As we mentioned previously when discussing Latin America, one possible way to measure the mortgage market is to determine the ratio of mortgage loans to the GDP. If we look at it this way, it is evident that the African mortgage bond market is quite moderate. The ratio is low throughout the African continent. South Africa's and Namibia's values of 30,6% and 20%, respectively, are already considered extremely high compared to the others, and these are the countries that have the most integrated mortgage markets [10]. At the same time, we should consider that these are the only countries in the entire Sub-Saharan region where mortgage loans are over 5% of the GDP[2].

After South Africa and Namibia, North Africa is the most developed region of the African continent with regard to the mortgage market. In Morocco, the ratio of mortgage loans to the GDP is 7%, while in Tunisia and Egypt these values are 5,9% and 3%, respectively [12]. Towards East Africa, in Kenya, the mortgage market operates quite well, however the ratio here is still only 2,5% of the GDP. This actually symbolizes a total of 13 thousand individual mortgage loans in the entire country [13; 14]. Towards West Africa, in Ghana and Nigeria the same ratio is around 4%. In Chad, mid-Africa this value is only 0,1%, while in Congo there is no mortgage loan market at all to mention. These numbers clearly and undoubtedly indicate that the mortgage market in Middle Africa is quite underdeveloped.

Despite the fact that there is immense room for growth in the mortgage market on the African continent, the vast majority of households do not have access to mortgage loans. *Walley* [13; 14] points out that merely 3% of African households have adequate income that would allow access to loans. Although this

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[2] For example, in North American and Europe mortgage loans account for over 40% of the GDP. In the Netherlands, Ireland, Switzerland and Denmark this ratio is over 80% of the GDP [11].

number is higher in urban areas, throughout the continent most of households have to resort to other financial sources to meet their housing needs.

It is intriguing that the Kenyan housing financing system has grown noticeably in the past few years, both in terms of the value and number of loans. Here, the market has already surpassed its germination period and will likely enter into the next developmental phase. That is why it is important to consider what conditions are necessary for guaranteeing continued development [10].

Truly speaking, not everyone requires help from the government to fulfill their housing needs. It is obvious that the poor need the help of the government, however there is a significantly expanding societal layer on the African continent, which would be capable of taking on a mortgage loan. According to *AfDB* [15] the African middle class has grown both in terms of its size and its purchasing power in the past decade. All of this is primarily due to the fact that over the past twenty years, a considerable economic expansion has been taking place on the African continent. Moreover, the result of this expansion is that the quality of live of households has improved significantly, and many of the poor have caught up to the middle class: in 2010 approximately 313 million people (over one third of the African population) had an income of 2 to 20 dollars per day: meaning that there are three times as many people belonging to the middle class now, as there were in 1980, and twice as many as in 1990.

According to *AfDB* [15] the middle class can be divided into two large groups. One of these is the traditional middle class: those who make from $4 to $20 per day belong to this group. The other class is a so-called floating class, the individuals of which consume somewhere between $2 and $4 per day. The members of this floating class are the ones who may potentially enter the traditional middle class, if the economy continues to grow. According to the study, around 44% of the population may belong to the middle class where daily income ranges from $2 to $20. In some African countries this group may encompass 10 to 90% of the population. This may present a strong challenge, but at the same time, it may also serve as an opportunity, if the right alternatives are presented on the housing market [10].

According to *SBG* [16] by 2030 the number of middle class households will increase from 15 million to 40 million in 11 of the fastest growing countries in Africa. In addition, several large cities are growing at an incredibly fast pace. For example, the populations of Kinshasa, Nairobi and Dares-Salaam are likely to increase by 70% by 2025. Nigeria will have 7,6 million more middle class households, while a 1.6 million increase is expected in Ghana. Sudan and Angola will each grow by 1 million middle class households [17].

In spite of this, the African continent is generally regarded as the embodiment of economic and social problems, where institutions are corrupt and there is a great lack of real government control. Yet, there are exceptions: countries which are undergoing significant development both economically and politically. At the beginning of the new millennium Africa's economic growth started to speed up (the average annual growth was over 5%) [17]. In addition to the continent's most important driving engines of growth, Nigeria, Kenya, Angola, Ethiopia, the economies of Tanzania, Ruanda, the Ivory Coast and Senegal are also growing rapidly.

Consequently, the African housing market will already grow significantly in the mid-term and this tendency will only be strengthened by the continent's population increase. The current population is over 1 billion and it will probably reach 2.4 billion in the next 40 years. This means that adequate housing will need to be provided for hundreds of millions of Africans in the next few decades. It is also important to mention that if the current tendencies continue, by 2030 there will be 300 million more Africans living in cities [17]. For them, access to affordable and financeable housing will be a key issue.

Currently the governments of individual countries cannot, and maybe would not take any serious measures to solve the lack of housing — this gives way for private investors. The price per square meter of homes built by private investors (which are larger and better quality) will increase considerably, and the infrastructure around these built homes will also need to be established (schools, hospitals, parks and other services). Since most governments possess very small capacities, the establishment of such services also adds to building costs. At the same time, borrowers with little income who would undertake a long term financial commitment such as a mortgage loan, cannot find a home that they could actually afford. Thus, the housing market problems of the African continent continue to pile up.

Asia and China

Compared to Europe, the Asian mortgage market is extremely heterogenic, therefore it is difficult to point out its most important features [18]. Mortgage loans account for 9% of the nominal GDP in India, 20% in Thailand, 45% in Hong Kong and 56% in Singapore [18; 11]. In Japan, this ratio is 41%. The current GDP per capita in Asia is around four times what it was in 1990. The mortgage markets of several Asian countries are changing dramatically, which results in many opportunities, but also many challenges. In the coming years, this region will probably become the growth center of the world economy, however, currently the mortgage markets of plenty of Asian countries are still in their development phase [19]. It may not come as a surprise that the largest mortgage market of this region is that of China. According to data from June 2004, the market was the size of 1670.7 billion dollars (13,800 billion renminbi/yuan), and grew to 19,600 billion renminbi by the end of 2016 [20]. After China, Japan is the next highest ranked in terms of mortgage markets. It is however worth pointing out that both the Chinese and the Japanese markets are modest compared to the mortgage markets of the United States or the United Kingdom. Another interesting fact is that the Chinese mortgage market is smaller when looked at in proportion to the country's population. This is also true in comparison to Hong Kong.

The first mortgage loan was granted by China Construction Bank (CCB) in 1986, while in 2005 it issued its first mortgage-backed security (MBS). At the end of 2011 the value of mortgage bonds outstanding was \$1,04 thousand billion, which is equal to 6.6 thousand billion renminbi. The annual growth rate of this was 15%. The stock of non-performing loans remained a stable 0,3% throughout 2011. One of the biggest challenges for Chinese decision makers is to keep rising housing prices in check. Different measures were introduced by authorities, but Chinese citizens are quite willing to buy tangible assets such as real estate, even if that real estate can only be bought for 70 years, i.e. the right of ownership expires after this time [21]. The most frequent mortgage loan types in Asian countries are adjustable rate mortgages (ARM) — mortgages with a fixed rate for a certain amount of time, which later become adjustable — and fixed rate mortgages (FRM). Typical requirements that give rise to mortgage loans show that the loan to value (LTV) ratio moves between 70 to 80%. Vietnam has the lowest ratio, 50%, while India has the highest: 85%. The terms of mortgage loans vary, comprising 20 years in India, Indonesia and South Korea for example, while in China, Japan, Malaysia and Vietnam it is 30 years.

By analyzing 13 South Asian and Southeast Asian country studies, *Cacnio* [22] points out that the size of the stock of mortgage loans does not present a great risk to regional banks' financial stability. With regard to India, *Kumar* [23] emphasizes that within the complete loan portfolio, the increase in the ratio of housing loans is negatively linked to the increase in the number of non-performing loans (NPLs).

Based on our observations so far, we can establish that mortgage markets are growing at incredible speed in a few countries, although they remain modest compared to some developing or developed countries. The total value of mortgage loans and their proportion to the GDP still remains very insignificant in Asian countries.

In contrast, the number of challenges to be faced continues to increase, since India remains one of the fastest growing countries at the beginning of the third millennium, and its economic growth is mostly fueled by domestic consumption. 32% of the population is now urbanized, although this ratio will probably reach 40% by 2030. Demographic realities are favorable, as 66% of the population is under 35 years old. The Indian middle class is likely to expand by 380 million individuals from 2015 to 2022, which will pose a challenge for the Indian housing market.

According to *Lindfield* [24] nearly 55% of the Earth's population will live in cities by 2030. Each year the populations of cities grow by 3%. In some Asian countries a large city may even be compared to an autonomous country economically, as well as from the point of view of the population. Large cities such as Bangkok, Manila and Tokyo represent a huge part of the GDP in their individual countries. Still, finding a home remains difficult for many Asians. The analysis by *Yoshino—Helble* [25] reveals that out of measures to be taken on the demand side, the most cost-efficient solution would be to lower mortgage loan interest. For people who are renting their homes, the most efficient solution is financial support. This last conclusion draws attention to the need for state intervention.

We must begin our brief overview of the Chinese mortgage market by explaining that there are currently two types of institutions which finance the acquisition of homes (general financial and special housing financing institutions). General financial institutions play a much more definitive role in the mortgage market, and indeed, the five state commercial banks play a role that is even more important. These (previously state-owned) banks have been listed since the 2000s and conduct their business activities under the strict supervision of the central bank. Another important unique trait is that the there is both a primary and a secondary mortgage market [26].

Commercial individual loans and housing provident funds (further — HPFs) can be found among mortgage loans in the primary market. As there is a quantitative ceiling for the latter, these are not always enough to buy a home, due to high housing prices. The so-called hybrid mortgage loan was born as a solution to this. This loan combines the maximum value of housing provident funds and commercial mortgage. Historically, the latter was more significant, as, for example, in December 2014 HPFs accounted for 19,22% of all commercial mortgage loans. All of China's mortgage loans have an adjustable rate, the primary reason behind which is the central bank's declared intent. If the central bank corrects the interest rate, this will apply to all mortgage loans where the maturity is over one year. The new interest rate is applied from the beginning of the following year. From 2005 on, commercial banks have the chance to change the interest on mortgage loans. The size of the minimum down payment is determined by the central bank and is currently 20%[3], while the maximum maturity is 30 years for mortgage loans. In addition, the total sum of the age of the borrower and the maturity cannot be more than 65 years [26]. The risk associated with mortgage loan repayment is relatively low in China. Furthermore, in most cases non-performance is related to real estate development, where developers cannot fulfill the commitments that they undertook and cannot meet the conditions set in their contract. It is also important to mention that low risk is due to strict banking regulation, which take into account the future debtor's income, occupation and the condition of the real estate in question. Borrowers need to submit quite an array of documents (a tax refund certificate, a bank account statement, and other certificates proving ownership of any other real estate, vehicle or stock, if applicable). In fact, banks may also request further guarantees and commercial insurance. Later on, from time to time banks examine the ratio of non-performing loans in their portfolio [27].

With the fast growth in retail mortgage loans, commercial banks strive to improve the liquidity of mortgage loans, however they only have limited opportunities to sell their mortgage products at capital markets. That is exactly why the central bank started a pilot program for commercial mortgage-backed securitization (MBS), within the framework of which China Construction Bank could issue 3 billion yuan's (RMB) worth of commercial mortgage-backed securities. Later, in September 2014, the central bank issued a statement in which it set the popularization of issuing MBS and other long-term maturity financial bonds as the means to ensure that the capital requirements for mortgage loans are met. This was especially important because of first-time home buyers.

Purchasing a home is often a problematic affair in China, since the market is actually a two-tier market. There are many unused homes in rural areas, and supply is much higher than demand here. However, nobody ever moves into these empty homes. In comparison, the exact opposite is true for large Chinese cities, where prices are continuously increasing. This feature of the housing market makes it necessary to always apply two types of intent and direction in decision making about housing policy. In case of the cities at the first level, it is a significant problem that banks are not so keen on lending to

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[3] Previously, in the case of some cities, this was raised to 25%, and was then once again lowered to 20%.

an already indebted population. This does however result in more and more people turning to the shadow banking system (a much riskier source), which further contributes to the increase in housing prices. Many already correlate this type of lending with the global financial crisis of 2007—2009. In this case, therefore, it is visible that the mortgage lending practice developed up until now has some serious shortcomings [27].

As for the future, we must mention that by 2020 China's urbanization rate will reach 60%, which might mean that the available apartments in cities of a lower ranking may also soon become inhabited. Currently, however, the biggest concern of the Chinese housing market is the imbalance between the different levels. New apartments are being built in areas where there is little demand, as opposed to the most populated cities, where their supply is quite modest. In 2015 for example, 61% of new construction took place in third and fourth ranked regions, and only 5% of it in the primary regions [27].

In China it is clearly visible that prices on the real estate market are rising considerably, so much so in fact that many now find it impossible to buy real estate through the current mortgage options. It is largely due to this that the State Council of the People's Republic of China launched its initiative to promote leasing. Within the framework of this, taxes are to be reduced for property developers who lease their apartments instead of selling them. This initiative seems helpful at first glance, however the rate of return gained from renting out apartments is incredibly low in China. For example in Beijing and Shanghai it provides a mere 1,5% yield annually [27]. Chinese wages cannot keep up with the credit-fueled rise in real estate prices, therefore property developers also cannot gain adequate yield from leasing their apartments. In fact, it is also important to mention that in many cases investors must repay short-term loans, meaning that leasing — which provides less yield — is not in the least an option for them [28]. These problems are further exasperated by the way rental agreements are structured. Typically, renters borrow from banks to make an upfront, one-time payment to developers, which covers five years, but they can repay this loan over as many as 10 years. The upfront payment is good for developers, as it is a source of income and moderates the loss on unsold inventory, but it also delays debt repayment attached to the real estate unit [28].

China can't allow real estate prices to decline significantly, as homeowners have clearly come to expect their property values to rise continually. Given that household lending now constitutes 22% of the assets of financial institutions, a decrease in the prices of homes would lead to significant financial anomalies. To avoid such risks, China is turning towards development. Investment in real estate has increased by 14% compared to 2017 and development loans are up 21%. Instead of reducing leverage, banks continue to blow up the speculative bubble: mortgage growth is at around 20% [28]. One solution would be to slow lending. This could mean increasing required down payments, which would raise the capital risk weighting on real-estate assets for banks. Another would be to introduce a hard cap on new loans. However, if credit flow into real estate continues to increase at the same rate, no level of regulatory intervention will suffice.

By promoting real-estate lending and encouraging banks and developers to subsidize renters, the government is actually delaying lending structure reforms. Real estate developers are likely to increase their debt, while consumers must prepare themselves for longer rent-repayment terms. All of this will result in new homes becoming more and more unaffordable for buyers, regardless of their growing supply [28].

The United States

According to [29] the role of rented homes remained significant in the United States both before and after the 2008 crisis. This is mainly due to the fact that the labor force is much more mobile that it is in, say, the European Union [30]. It is a well-known fact that due mainly to high real estate prices, it is generally at the age of retirement and in rural areas that people own their homes. For actual homeowners (not those who buy with the aim of renting out) the size of the mortgage may become significant when the payment of installment presents an alternative for monthly rent. This can mostly happen in a low interest rate environment, otherwise it does not present a realistic alternative. The right to walk away, a classically American right, could cause and in fact has caused huge anomalies. The final root cause of the 2008 crisis was that those who borrowed prior had to repay increasingly larger installments due to the steep rise in interests. After a certain point their monthly repayments surpassed the level of rent by a very significant amount and debtors with a poorer economic background (meaning those whose debts were already covered by so-called subprime mortgages with higher risk and interest) started handing creditors the keys to their homes one after the other. In addition, it is also true that the prices of the massive amount of used (and worn and run down) real estate properties of previous debtors with a higher risk fell to a fraction of their original value over a short period of time, and therefore a large volume of American mortgages turned toxic (ultimately due to the right to walk away!).

It is therefore visible that the subprime mortgage crisis, which is now over in the United States, was a result of the dysfunctional operation of the financial system [31; 32]. It is a well-known fact that it managed to create the excessive indebtedness of the population, as well as a shadow banking system together with an unclearly structured product market, which was primarily characterized by the "hunt for yield". As was predictable, the outcome of this was the bursting of the bubbles in the summer of 2007 and the developing of the financial and liquidity crisis.

The subprime market became truly popular in 1990, due mostly to low interest and increasing leniency in determining creditworthiness. *Gramlich* [33] points out that these loans grew to five times their original volume between 1994 and 2000. However, according to *Király* [32] the true boom only started at the beginning of the third millennium. From 2001 to 2007 the volume of mortgages was multiplied by 6. While in 2001 subprime mortgages accounted for 5% of the complete mortgage loan portfolio, by 2007 their share grew to 15%. By the end of 2007, American households had borrowed a total of 13 thousand billion dollars (over 100% of the GDP). Out of these 10 thousand billion dollars were mortgage loans, and within them 1400 to 1500 billion were subprime loans [34; 35].

Prior to the crisis, the United States saw one of the biggest surges in real estate prices in its history. According to *Shiller* [36] based on the Case-Shiller-index (which takes into account geography as well), the value of residential real estates increased by 226% from 2000 to 2006. Securitization and increasing residential property prices had a positive influence on one another: the rise in the prices of homes increased credit supply, while the growing credit volume further boosted real estate prices [37].

We must observe that the surge in subprime loans resulted in the issuers of mortgage loans easing lending standards in a low interest rate environment and opening up towards riskier social classes, in addition to offering products available to less creditworthy debtors [38]. After the bubble burst, the American mortgage market froze spectacularly.

The 2008 financial crisis shed unmistakable light on the fact that fundamentally speaking, the mortgage loan is not a flawed product, but an unlucky combination of events may very easily render it so.

Europe

In this part we will give a brief overview of the state of the European mortgage market before the crisis and of today's tendencies. We talk separately about the EU15 (the member states that joined prior to 2004) and about the EU12 (the member states that joined after 2004). We decided to separate these two groups because the mortgage markets of the two regions differ in their fundamental features.

Mortgage Markets in the EU Member States. In the member states of the EU that joined after 2004, after the Soviet Union collapsed and the state socialist economic policy became obsolete and with the reform of the regulatory and institutional framework system, it became possible to continually develop the growth of the market economy [39]. After the transformational crisis the increase in the income of households was one of the most important pulls of banking markets [40]. Banks began their mortgage activities then. The emerging of mortgage markets was part of the financial development of the transforming countries [41].

In most countries, during this period of transition the previously state-owned real estate inventory fell into private hands, yet households did not use their owned properties as coverage for their financing needs. Mortgage and credit markets were built gradually in the 1990s, and, as we have previously mentioned, this also meant the deepening of financial integration. With the quick upsurge in lending, in the countries that had only recently joined the EU the full credit portfolio in proportion to the GDP increased from 17% in 2000 to 55% in 2007. In 2000 the mortgage loans of households constituted less than 5% of the GDP, while in 2007 this ratio increased to 25% of the GDP. The average statistical data is quite diverse: in Croatia, Latvia and Estonia, the ratio of household loans to the GDP was over 40% in 2007, while in both Romania and Slovakia this ratio was below 20%. Diversity was even more evident when comparing available income to household credit. While in Latvia and Estonia this reached 64% and 79%, respectively, in Romania it was 23% [42].

The ratio of mortgage loans within total household loans was also quite diverse when observing the newly joined countries. While in 2007 mortgage loans accounted for 80% of household loans in Estonia, in Romania this percentage was only 20. On average, mortgage loans accounted for 56% of household loans in 2007 across new EU member states. What this means is that mortgage loans represented only one (although quite an important) component of total household credit in these states.

It is also worth pointing out that in the case of both “old” and “new” EU member states there are significant differences in the denominated currency of mortgage loans. This warrants attention because the type of the currency of the borrowed funds influences the affordability of loans and the financial vulnerability of households. In the “old” EU states almost all household and mortgage loans were/are denominated in the state’s own currency, while in “new” EU member states a significant portion of mortgage loans was denominated in foreign currency (in euros or in Swiss francs). The fast increase in household loans was incentivized by demand, fueled by higher wages and higher prospective salaries for the future. The fact that foreign currencies with lower interest received more consideration can be explained by rational expectations in connection with appreciating local currencies. This can, in turn, for the large part be explained by the Balassa-Samuelson effect.

However, the mortgages denominated in foreign currency showed significant diversity in the case of “new” EU countries. This ratio was less than 1% in the Czech Republic and over 50% in Hungary, while it almost reached 90% in Romania. In the case of Hungary, this ratio was already quite risky, as most of these mortgage loans were denominated in Swiss francs, which is much more volatile than the Euro [43]. The ratio of loans with variable interest also differed among countries; their ratio in Hungary, Slovakia and Slovenia neared 80%.

Mortgage Markets in the “old” EU Member States and in the Eurozone. In 1999, in the Eurozone, the volume of mortgage loans was about 27% of the GDP, while in the year before the crisis (2007) this percentage grew to 42. The reasons behind this increase were low interest rates and more intense competition on the mortgage market, mostly noticeable through reduced surcharges. The average volume of mortgage loans increased, which was also aided by the lengthening of their maturities. In addition, in the years before the crisis an intensive competition resulted in the introduction of new mortgage market products that made it possible for the population to take out mortgages of higher sum-to-capital ratio. The index demonstrating indebtedness per capita reached a record high in 2007 throughout the entire Eurozone. Compared to 1999 it now differed less between countries, which proved that households with less debt had “caught up” in terms of the level of their indebtedness, and that property prices increased at varying rates [44].

Between 1999 and 2007 the gross total interest payment obligations of households in Belgium and Germany decreased, while they increased in Spain, the Netherlands[4], Portugal and Finland. In 2007, they stayed at a relatively low level in Italy, and somewhat increased (by around 4%) in Germany, Spain, Portugal and Finland. From 1999 to 2007 the volume of loans for buying homes grew the most in Greece (by 30,3%) and the least in Germany. Property prices increased the most in Spain (by 11,9%) and the least in Austria (by 1,2%) [44].

In Western Europe the household mortgage balance portfolio demonstrated

[4] Interest payment obligations were extremely high in the Netherlands, although one of the reasons behind this was the large proportion of households with mortgages.

in proportion to the GDP grew from 42% to 50% of the GDP from 2000 to 2007, while the stock of household loans showed no significant variability. In Italy it reached 30% of the GDP, while in Denmark it jumped to 124%. 54% of homes were purchased with the help of a mortgage in Austria, while this ratio was nearly 90% in the Netherlands. On average, mortgage loans accounted for 72% of all Western European household loans in 2007. The proportion of loans with variable interest varied more: one-third of all loans in France and Denmark, compared to 95% in Portugal [42].

After the 2008 mortgage crisis the regulation of financials systems changed and mortgage was managed more cautiously. In some EU countries we can observe a large-scale decline in the loan portfolio since 2008, mostly in countries such as Ireland, Portugal and Spain, where there is visibly excessive indebtedness. In these economies the gross stock of mortgage loans in 2016 was much lower than in 2007, although it has noticeably started increasing in the past few years [44].

In 2016 the mortgage market showed two contradictory sides. In some countries variable rate mortgage loans are the only ones that continue to be offered, while in others there are also long-term maturity, fixed rate loans or a some type of other version of them offered. However, here it is important to mention that there seems to be a new tendency for fixed rate interest to be dominant, since the borrowers of the loans are trying to make the best use of the currently available favorable conditions, and are also making wiser decisions.

The size of outstanding loans in the EU decreased by 1,4% from 2015 to 2016, which is, among other causes, also the result of the depreciation of the English pound due to Brexit. Not considering changes in exchange rates, retail lending grew by 167 billion euros. Observing the tendency of the past 10 years, there are five dominant countries on the EU mortgage market: the United Kingdom, Germany, France, the Netherlands and Spain. Combined, these countries accounted for 81% of the total retail mortgage loan portfolio of the EU in 2016.

The variability trends of mortgage loan interests have turned around recently and in certain cases, interest rates have started to rise.

A different type of duality is visible in the fact that while in Mediterranean countries people see it as important to own their homes, in Germany, for example, people would rather rent their homes and invest in other types of assets. In addition, households demonstrate significant heterogeneity in whether they buy their homes with the help of mortgage or not. In the Netherlands, for example, 60% of home buyers took on mortgages, while in Romania, the opposite is true: only 0,9% of the population used a mortgage and 95,6% of the homeowners bought their properties without one[5].

The fact that EU mortgage loan debtors have different preferences with regard to fixed or variable interest mortgage loans is a result of different regulatory environments and cultural factors. It is most definitely true, however, that fixed rate loans have become more popular in lower mortgage loan interest environments, since consumers try to make the best of cheap money, even with interest rates on the rise. We can observe this process the most clearly in Spain,

[5] URL: https://ec.europa.eu/eurostat/statistics-explained/index.php/Housing_statistics.

where at the end of 2016 about 58% of new loans had some kind of fixed interest period initially, compared to 2015, when this ratio was only 37%.

As a result of an improving labor market, economic growth and a low interest rate environment, the aggregated gross lending indicators of the EU followed/are following an upward trend started in 2012 and have by now reached a level similar to that of 2007, before the crisis. Due to the significant growth of mortgage markets, many countries have introduced stricter macroprudential regulations, in order to prevent the market from getting overheated. The most important measures taken are stricter LTV regulations or actually regulating the loans that exceed the LTV threshold value. The reason why this is necessary is because it protects debtors who own less capital for buying new homes. Amortization rules similar to those of the Swedish Financial Supervisory Authority have been created [45]: these rules introduce much more restrictive limits for debtors with a loan-to-income (LTI) ratio above 4,5%.

Following this overview of the situation of the global mortgage market, we will analyze the parameters of mortgage loan repayment, as well as presenting a new type of mortgage loan facility, for which we will provide evidence with the help of financial mathematics. Through this, we aim to provide a practical solution that can be applied in real life for moderating or resolving the problems and risks that were presented in the overview above.

Summary and Conclusions

In the introductory section of our paper we highlighted the most important features of the global housing and mortgage markets. Some challenges are looming and there are positives signs as well. Later, with the help of the review of the most recent literature, we confirmed that there are fundamental problems with the the global mortgage markets. The issues are different and currently it is quite clear that the well-known mortgage policy cannot be sustained in the longer term. Namely it is getting more and more difficult for the next generations to buy real estate as the initial monthly repayments in the first years are too high in comparison with the monthly salaries. Also it is important to keep in mind that the population of some countries and continents is increasing at a very rapid rare and there are a number of other demographic shifts as well.

Based on our findings and after taking into consideration the global tendencies, we try to give a solution for the most important challenges of the global mortgage markets in the second part of our paper.

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AN OVERVIEW OF THE GLOBAL MORTGAGE MARKETS

As the population of the world continues to grow and living standards continue to improve, we must find an adequate solution for housing issues. The first part of this paper tries to shed more light on the drawbacks and the past anomalies of the world mortgage market. We observe different continents and try to point out the main causes behind the bottlenecks of mortgage markets. The reasons vary across countries but some similarities emerge, such as that in the initial period repayment places a huge financial burden on households.

Keywords: Africa, Asia, challenges and trends, China, Europe, Latin America, mortgage markets, overview, United States

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