World of Real Estate Journal
SWIAT NIERUCHOMOSCI

Causes of Mortgage Loan Prepayment

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ABSTRACT

Purpose – The default was always found as the main risk that the banks face, as it mainly appears when the interest rates rise. On the other hand, when the interest rates fall, the borrowers may pay off their mortgages earlier. Prepayment behavior has been studied in the US since the early 70s, the article aims to present the development of mortgage risk management and to indicate the change of its assessment in Poland.

Design/methodology/approach – A systematic review of the literature and an analysis of the real estate market in the US were used to distinguish the most common reasons for prepayment origination.

Findings – The study indicates four reasons for prepayment origination. The borrower's incentives to prepay are distinguished by the ones caused either by the borrower or market situation. Each of those four reasons indicates situations they occur and presents some standards of its measurements. The study presents difficulties with the measurement of prepayment risk and suggests the areas of focus.

Research implications – The risk assessment during the mortgage approval process in Polish banks should include the prepayment risk to limit its scope rather than imposing prepayment penalties.

Keywords:	mortgage; prepayment; risk; real estate; banking
JEL codes:	G21; G51; R31
Article type:	review article
DOI:	10.14659/WOREJ.2020.111.02

INTRODUCTION

Prepayment potentially affects all types of mortgage loans, in particular, the residential. Prepayment is understood as all kinds of payments exceeding the standard amortization schedule. For a mortgage bank, the prepayment risk is significant, as it usually occurs in times of declining interest rates. Prepayment rate is not constant and has changed notably since the beginning of the 1990s. Prepayment is difficult to estimate as to the factors determining it, such as the demographic characteristics of the borrower, the mortgage loan approval and management process, the cost and availability of refinancing, usually change unpredictably.

The prepayment risk is not considered a key type of risk that mortgages institutions face in Poland. According to many papers, the authors list credit risk, interest rate risk, exchange rate risk, or liquidity risk (Wyrzykowski, 2011) as the main types. The interest risk can be considered as the most similar one to prepayment risk. Among banks in Poland, there is a practice of setting up a prepayment penalty in mortgage loan contracts. Credit risk is still considered as the main problem that banks need to tackle.

In this paper, the reasons for earlier mortgage payments are presented. The most common reasons for prepayment origination were identified based on a systematic review of the literature and an analysis of the real estate market in the US. The first section presents the main four reasons for prepayment. The next section introduces the housing turnover, the third section is devoted to the biggest factor, which is refinancing behavior, then the last two sections describe default and curtailments. It is also described how each of the prepayment risk areas can be captured and in which situations they occur.

MAJOR REASONS FOR MORTGAGE PREPAYMENT

Polish literature does not focus on the prepayment risk at all. On the other hand, the west literature has been studying prepayment risk since the 80s. As Hayre and Young wrote (2001): “Prepayment projections are at the center of all mortgage security valuation and analysis”. Mainly in the United States, prepayment is found as one of the risks that banks need to face. It may be connected with the level of development of the banking system. The key feature of the credit industry in the United States is Mortgage-Backed Securities, which are pools of mortgages sold as an investment product. The cash flows of these instruments are very sensitive to prepayment behavior as it shortens the investing perspective. According to Fabozzi, Bhattacharya and

Berliner (2010), the following three factors have influenced the volatility of prepayments: the increase of real estate value, the growth of variable interest rate loan market, and overall development of the consumer-friendly mortgage industry.

The most cited author in this area is Frank J. Fabozzi who has written dozens of papers connected with Mortgage-Backed Securities, real estate investments, and valuation process. Generally regarded cause for mortgage prepayment is changes in interest rates. The paper of Green and Shoven (1986) attempts to measure the dependence of the duration of mortgages on the interest rate changes. The results indicate that market interest rates are a significant determinant of prepayment probabilities. Only ten percent of mortgage premium reduces prepayment probability by 35 percent. According to Hakim (1997), the prepayment varies depending on financial and general economic factors as well as borrower's characteristics. His study has shown that the prepayment probability increases when the mortgage LTV ratio is relatively high. The research findings suggest that the prepayment ratio is dependent on the debtor age, family size, and the years of occupying the property. The same findings can be found in Deng, Quigley, and Van Order paper (2000). Also, the research shows the mobility rate and region of mortgage origination have a positive correlation with prepayment. On the other hand, Peters (1984), checks the impact of several variables on conditional prepayment rate (CPR), such as refinancing costs, mean of household earnings, the difference between contract and market rate, borrower's age, property size, regional migration and growth of GDP. The result shows that the greatest impact on prepayment has refinancing costs. Quigley (1987) researches mobility factors influencing prepayment. He finds that size of the household and the level of education of its members are positively correlated, but the reverse relationship occurs with the borrower's age and mortgage premium. Rose (2013) studies the influence of penalties on prepayment. Findings of the research highlight the negative correlation between penalty and prepayment rate.

As mentioned, prepayment is one of the characteristics of a mortgage loan. The following classification of prepayments applies according to the reason for their origination (Hayre & Young, 2001, p. 132-133):

1. Housing turnover, which may occur as a result of (Fabozzi, Bhattacharya & Berliner, 2010, p. 72):
    a. Moving of borrower to a different property,
    b. Trading up to a larger house or trading down to smaller house by obligator,
    c. Relocating of homeowner due to job change,

   d. Selling property due to the death of a homeowner or as a part of a divorce settlement,
   e. Destroying property by any natural disaster.

The amount obtained from the sale or insurance settlement is transferred as a prepayment to the lender. Generally speaking, the sale of real estate leads to prepayment. The exception is a property whose mortgage is taken over by the new homeowner or is not charged with a mortgage.

2. Refinancing, this occurs when the borrower does not prepay mortgage loan because of a home sale or its destruction. The obligators decide to refinance their mortgage loans to reduce the loan's interest rate and, consequently, to lower the monthly payment. This type of refinancing is called rate-and-term refinancing and those borrowers who can reduce interest and monthly installments by taking out a new loan carry it out. Another reason for refinancing a mortgage loan is to liquefy the borrower's equity. This kind of refinancing is referred to as cash-out refinancing and is undertaken as an alternative way of second lien mortgage. The mortgagors utilize this refinancing type when the current interest rate is low enough. It becomes more profitable for the debtor to liquidate the capital by refinancing the entire loan, instead of a second lien on the amount of capital to be liquidated.
3. Defaults, that tends to happen among the borrowers with poor credit scores. The main reason is obligators that fall behind with monthly payments, due to inability or unwillingness to meet payment deadlines. In a situation when the mortgage is not being paid off, the collateral property is sold, and the amount obtained is used to settle the loan. Such actions result in involuntary prepayment. The debtors with poor credit history tend to prepay the loans from other reasons than failure to pay monthly installment such as (Fabozzi, Bhattacharya & Berliner, 2010, p. 91):
   a. Borrowers who lost their job and remain unemployed might sell the property even before they fail to meet monthly payments, often referred to as a semi-voluntary prepayment,
   b. Obligators who have become more credible to lending institutions, they can refinance the liability at a lower interest rate or reduce the monthly installment by operations called credit curing.
4. Curtailments and full payoffs (Hayre & Young, 2001, p. 133), which occurs when a debtor tends to pay more than the monthly installment indicates. Paying more than required occurs regularly,

with each payment or irregularly. This situation takes place when the borrower wants to save and therefore reduce the duration of the mortgage. Full repayment occurs when the debtor completely pays off the outstanding amount, usually when the loan balance is small.

HOUSING TURNOVER AND MORTGAGE LOAN PREPAYMENT

As introduced, one of the causes of prepayments is the sale of a property. In the absence of refinancing, housing turnover is a key element of the prepayment rate. Several factors affect the number of real estate transitions.

The first one is a housing turnover rate (Hayre & Young, 2001, p. 136), i.e. the percentage of existing properties that are likely to be sold in a given period. Having data showing the number of existing home sales and the entire stock of existing properties, it is possible to calculate the turnover rate.

Table 1. The turnover rate of existing properties, USA, 1987-2017

Year	Average mortgage rate	Sales of existing properties in billions	The housing stock in billions	Housing turnover rate
1987	10.20%	3.44	89.48	3.84%
1988	10.33%	3.51	91.07	3.85%
1989	10.32%	3.35	92.83	3.61%
1990	10.13%	3.21	93.35	3.44%
1991	9.25%	3.22	94.31	3.41%
1992	8.40%	3.52	95.67	3.68%
1993	7.33%	3.80	96.39	3.94%
1994	8.36%	3.95	97.11	4.07%
1995	7.93%	3.81	98.99	3.85%
1996	7.81%	4.09	99.63	4.11%
1997	7.60%	4.21	101.02	4.17%
1998	6.94%	4.99	102.53	4.87%
1999	7.44%	5.20	103.87	5.01%
2000	8.05%	5.17	104.71	4.94%
2001	6.97%	5.34	108.21	4.93%
2002	6.54%	5.63	109.30	5.15%
2003	5.83%	6.18	111.28	5.55%
2004	5.84%	6.78	112.00	6.05%
2005	5.87%	7.08	113.34	6.24%
2006	6.41%	6.48	114.38	5.66%
2007	6.34%	5.65	116.01	4.87%
2008	6.03%	4.91	116.78	4.21%
2009	5.04%	5.16	117.18	4.40%
2010	4.69%	4.91	117.54	4.18%
2011	4.45%	4.26	118.68	3.59%
2012	3.66%	4.66	121.08	3.85%

2013	3.98%	5.09	122.46	4.16%
2014	4.17%	4.94	123.23	4.01%
2015	3.85%	5.25	124.59	4.21%
2016	3.65%	5.45	125.82	4.33%
2017	3.99%	5.57	126.22	4.41%

Source: own work based on the Federal Reserve System, National Association of Realtors, and U.S. Census Bureau data.

Table 1 presents annual data from 1987 to 2017 including mortgage rates, existing home sales, total housing stock, and turnover rate on existing homes, meaning the number of homes sold as the percentage of the housing stock. The housing turnover rate can be interpreted as the total prepayment rate resulting from property sales. Analysis of data shows that the housing turnover ratio fluctuated between 3% and 6%, with the highest rate recorded at the beginning of the year 2005 when interest rates began to rise. Undoubtedly, interest rates, and consequently the mortgage rate affect the turnover rate and prepayment rate as well. If there is a sudden and sustained increase in mortgage interest rates, it will reduce the property sales, and thus the turnover rate. However, after some time, the real estate market will adjust to higher interest rates, which will increase property sales and demand. Besides mortgage rates, the business cycle and economic growth are equally significant factors. For example, the housing turnover rates were the same in 1985 and 2012 despite mortgage rates being over 6.65 percentage points lower.

Other factors, such as the real estate tax system, economic welfare, housing situation, and changes in the number of inhabitants can be an incentive to change the place of residence (Schultz, 2016, p. 119). Relocation and migration between regions or countries are mainly caused by employment. Stronger economic growth in one region compared to the other may lead homeowners to seek greater opportunities through mobility, thus increasing real estate turnover ratios in these regions.

Family creation and dissolution are also one of the key factors (Schultz, 2016, p. 120). When a family is growing up, homeowners are looking for a bigger property or other neighborhood, where the education level is higher. The reverse tendency is observed in families where children have reached the age of majority, as they leave the house, the other residents are looking for real estate with a smaller house.

Another factor is the affordability of real estate (Hayre & Young, 2001, p. 188), understood as the buyer's ability to pay monthly loan installments. It is often expressed as the ratio of loan installments due in a given month to

the monthly income of the property owner. The affordability of real estate does not depend only on the current economic situation but is strongly associated with past events.

Property sales volume exhibits a seasonal pattern (Ngai & Tenreyro, 2014), which affects the turnover rate. Studies have shown that the turnover rate reaches its highest volume during the summer, with a significant downward trend over the last months of the year.

The next factor is the seasoning process of the prepayment rate of newly launched mortgage loans (Hayre & Young, 2001, p. 140-141). The standard approach assumes that the process of adjusting depends only on the time elapsed since the loan was originated and it equals about 30 months (Fig. 1). When the mortgage loan reaches the age of 30 months, the probability of prepayments stabilizes and then slowly decreases. The length of this period depends on the type of loan and borrower's financial situation. The loan seasoning is a complex process and differs depending on multiple factors.

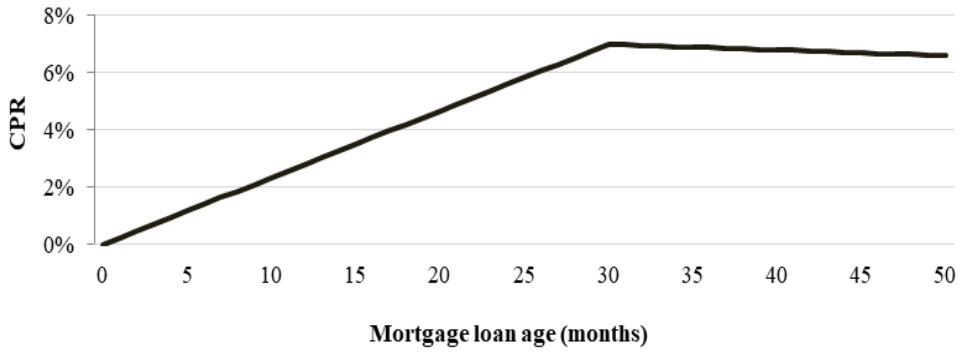

Figure 1. Seasoning pattern of mortgage loan
Source: own work.

Significant expenses associated with borrowing cause the low prepayment rate in the first years of the mortgage loan. Costs related to own contribution, transaction costs like bank fees, taxes, or if the purchased property is in a base build, the cost of furnishing the house absorbs most of the borrower's savings at the very beginning. Therefore, after the majority of property purchase transactions have been carried out, there is a period in which there are no unnecessary expenses. Also during this period, the borrower avoids changing his place of residence, unless he is forced by circumstances. The result is a low amount of prepayments in the initial loan term. The seasoning rate depends on economic welfare. The increase in

property prices leads to an increase in its value, which may contribute to the growth of the entire market. On the other hand, falling prices may limit the opportunities for property sales and a decline in market activity.

The last factor affecting the property turnover rate is the so-called lock-in effect (Chan, 2001). It means that the likelihood of property change is lower due to having a mortgage loan with a lower interest rate than currently prevailing on the market. Moving would involve taking out a new loan with the current higher interest rate, and thus increasing expenses. To measure how much the owner is locked-in his property, it is needed to calculate two quantities. The first one is the cost of changing the current interest rate of the mortgage loan to a new interest rate. The higher the cost, the more a borrower is locked-in the property. The second quantity is the ratio of the current mortgage balance to the expected amount of the new loan. As the ratio decreases over time as the loan is amortized and property prices increase, the lock-in effect decreases as well. The situation is different in the case of mortgage loans, which can be taken over with the purchased property, without causing a prepayment. When the current market's mortgage interest rates exceed the property mortgage interest rate, the seller may include this difference in the selling price. In this case, both the seller and the buyer benefit at the expense of the lender, who still has in his portfolio a loan with a lower interest rate than the market interest rate.

REFINANCING AND MORTGAGE LOAN PREPAYMENT

The high rate of prepayments is in most cases caused by refinancing behavior. Each borrower seeks opportunities to lower monthly payments and one way to reduce them is to refinance the debt (Fabozzi, Bhattacharya & Berliner, 2010, p. 77). If the market's interest rates drop below the mortgage loan interest rate, the debtor can take out a new loan, by which he will repay the current liability and cover the early repayment penalty. Growing property prices and the overall development of the credit industry contribute to the rising percentage of obligators that are taking advantage of refinancing.

Attempt to model prepayments resulting from refinancing behavior is a complex process that requires addressing several problems.

The first obstacle that arises is finding the reasons for refinancing incentive (Fabozzi, 2007, p. 271), the impulse prompting the borrower to such an action. The simplest answer that comes to mind is to compare the interest rate of current mortgage loan with those currently available on the market. However, this issue is more complicated than it seems. The market offers interest rates and loan periods that vary depending on the lender, the

region in which they are offered, the credit history of the person applying for a mortgage loan, the LTV ratio, or the loan balance. An important component in deciding to refinance a mortgage loan is the costs associated with it. Costs include originating fees, credit insurance, and property valuation costs. The factor that must be taken into account is the issue of time delays, that is, the time that passes from the submission of the mortgage application up to the time it is approved. It takes several weeks after applying for a loan to complete the formalities such as checking the applicant's credit history, income sources, and property values. The standard approach assumes a 2-month delay between submitting an application for a loan and the closing day, therefore the occurrence of prepayment. There are some dependencies regarding the amount of time needed to refinance a loan. The refinancing process will take less time if the current loan is relatively new, the borrower has a good credit history and the mortgage loan approving system is efficient and automated.

Another problem when estimating the refinancing ratio is the dynamic burnout process (Gan, 2009). This process involves a noticeable slowdown in the level of prepayments caused by the interest rates compared to the previous, intensive period. The borrowers themselves influence the dynamics of the process by their willingness to refinance. The presence of a large percentage of refinanced loans in the mortgage pool can indicate a higher prepayment rate. The simplest approach is to divide all borrowers into slower or faster responders, i.e. those whose mortgage loan refinancing probability is lower or higher. On the other hand, it can be assumed that there is a continuous set of borrowers limited by the slowest refinancers at one side and the fastest on the other. Thus, the refinancing rate for the entire pool will be the average refinancing rates of individual borrowers in categories, weighted by the share of the given category in the entire pool. It should also be noted that the pool composition changes over time (Fig. 2).

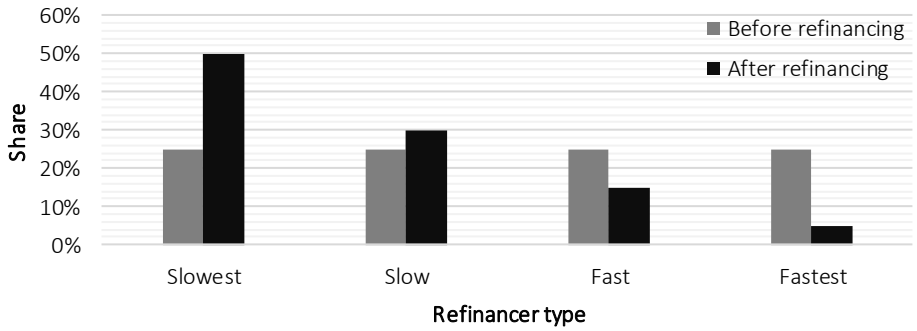

Figure 2. The burnout process
Source: own work.

Borrowers who have decided to refinance their loan faster will leave the pool earlier. If we consider a pool in which the percentage of slow refinancers is 5% and fast ones are 20% then over time slow borrowers share in the pool will increase and the refinancing rate of the entire pool will tend to 5%. It is believed that refinanced loans tend to season faster than the purchase loans because many factors influencing the seasoning process have been developed to some extent like the cost of furnishing, growing families, or purchasing the property itself. The burnout process is responsive to the changes in mortgage loan interest rates level as well.

The existence of various refinancer types is caused by their limited knowledge of the situation on financial markets and refinancing options. They often find out about declining interest rates from friends or colleagues, read financial information in the press, or hear it on television. This phenomenon is commonly referred to as the media effect (Hayre & Young, 2001, p. 158-159) and requires a significant change in the level of interest rates to raise the interest of the topic by the media. This effect increases refinancing activity and explains why refinancing is a dynamic process (Fig. 3).

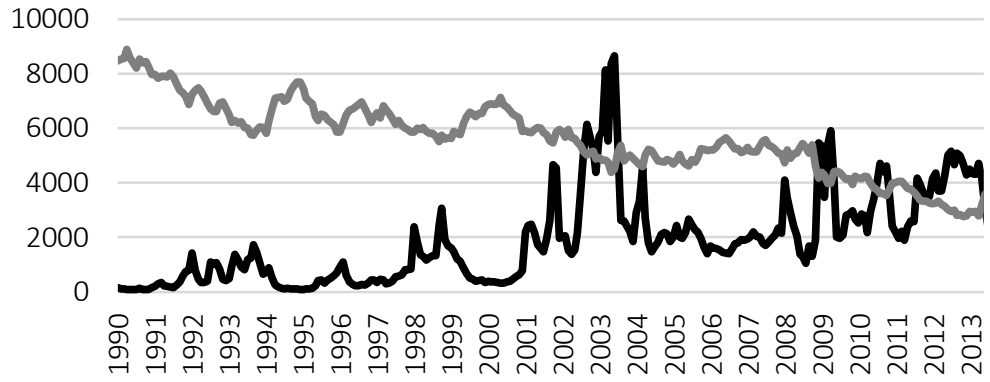

Figure 3. Mortgage loan rate impact on refinancing rate, USA, 1990-2018
Source: own work based on the Mortgage Bankers Association, Freddie Mac data.

The refinancing rate does not change when the interest rates show high volatility, while it increases rapidly when the interest rates decline without fluctuations. The highest observable refinancing rate occurred in mid-2003 when the average mortgage rate fell to the lowest level in history at that time.

The last factor affecting the refinancing dynamics are changes taking place in this lending sector (Fabozzi, Bhattacharya & Berliner, 2010, pp. 78-79). New and constantly evolving technologies contribute to the reduction of costs associated with the application process. New credit products, such as mortgage loans with a higher LTV ratio and hybrid mortgage loans, affect the number of refinancers. Changes in the laws, regulations, and policies of banks contribute to the availability increase of new mortgage loans. Mortgage banks allocate significant funds to marketing, by making contact with existing debtors or advertising their services. An important element in the efficiency increase of refinancing is the growing number of the economic press, which provides information about the current situation and helps to make more informed decisions about refinancing a loan.

DEFAULTS AND MORTGAGE LOAN PREPAYMENT

In the beginning, it is necessary to explain the path leading to the failure of paying off the mortgage loan. If the next monthly payment is due and the borrower fails to make the payment within the set deadline, he is considered to be in arrears. In the United States, the most common arrears classification is the one introduced by the US Office of Thrift Supervision, which divides the arrears into monthly intervals (Allman, 2007, pp. 59-60). Loans are divided

into having delayed repayment from 1 to 30 days, from 30 to 60 days, from 60 to 90 days and over 90 days. The borrower who does not meet monthly payments on time is expected to settle all payments so that there are no arrears on the account. Depending on banking regulations, the arrears eventually transform into a complete cessation of loan repayment. When the borrower is considered to be in default, the bank does not expect the situation to change and the monthly installments will be made according to the schedule. At this point, legal steps begin, as a result of which the borrower loses ownership of the collateral property. The loan is considered unpaid when the borrower defaults on the loan monthly payments and the period have exceeded 90 days.

Table 2. Reasons were given by borrowers for default

Mortgage default reason	Share
Changes in Income	41.8%
Unemployment	*17.4%*
Curtailment of Income	*22.0%*
Business Failure	*2.3%*
Death or Illness in the Family	23.2%
Extreme Financial Stress Other than Loss of Income	14.4%
Excessive Obligation	11.5%
Extreme Hardship	2.5%
Payment Adjustment	0.4%
Marital Difficulties	7.6%
Property Problem or Casualty Loss	1.9%
Inability to Sell or Rent Property	1.3%
Employment Transfer or Military Service	0.8%
All Other Reasons	9.0%

Source: (Cutts & Merrill, 2008).

Based on data (Tab. 2) from Cutts & Merrill (2008), cessation of mortgage repayment is most often caused by changes in income, over 40%. In this group over 17% of defaulters given unemployment and 2.3% Business Failure as the main reason for not repaying loans. In those cases, arrears result from labor market disruption. The biggest group reported curtailment of income as the reason for the failure of paying for a mortgage loan. Those changes usually are connected with reduced working hours, reduced pay, or reduced commissions or overtime pay, or loss of a part-time job.

The second reason why borrowers default is due to death or illness in the family. This reason reported over 23% of defaulters. The death of the principal borrower, especially if the borrower is providing only household income, is one of the reasons in this category. The medical problems are connected with a prolonged illness that keeps the principal Borrower from

working and generating income or injuries of the borrower, excessive medical bills, inadequate health insurance, health-related job loss of mortgagors who cannot continue to work, or caring for sick family members.

The next one, having the biggest share of over 14%, is default caused by extreme financial stress other than loss of income. The main reason for this is an excessive obligation. Servicing other debts is burdensome for the finances of the household. Those incurred debts, either in a single instance or as a matter of habit, prevent borrowers from making mortgage loan repayments.

Marital difficulties were listed as another reason, having a share of over 7% in total reasons for default. Households more often rely on more than one income when having a mortgage loan. Research shows (Boheim & Taylor, 2000) that households experiencing relationship breakdowns are more likely to be in arrears. The problems such as a dispute over property ownership, a reduction in the income to repay the mortgage debt, or a decision not to make payments until the divorce settlement is finalized result in default.

Other reasons listed, describe property problems such as an inability to sell or rent, caused mainly by the current market condition. They are connected with changes in employment such as employment transfer or military service and means that pay is insufficient to enable the continued payment of the existing mortgage debt. The last category, other, can hold the cases of changes in the economy, such as a rapid increase in mortgage loan costs, caused by changes in interest rates. The family situation, meaning the number of children, can impact the household expenditures. Incarceration, meaning that the principal borrower has been jailed or imprisoned, as very rare, can be attributed to a reason for the default.

CURTAILMENTS AND FULL PAYOFFS AND MORTGAGE LOAN PREPAYMENT

In a situation where the borrower pays more than the scheduled payment, it is considered that the loan has been curtailed or partially prepaid (McCollum, Hong & Pace, 2015). The borrower may also pay the full outstanding balance to reduce his debt completely. Studies have shown that the percentage of partial and full payoffs as a reason for prepayment is very low. The reason for this is that it is not an optimal solution for the borrower. If the mortgage rate is higher than the current market rate, refinancing the loan is more profitable. In the opposite situation, when the interest rate on the loan is lower than the market one, paying the scheduled payment with a surplus is not economically justified. However, these conclusions are very simplified

and they ignore more important facts. Refinancing costs can be significant and if the borrower cannot afford it, partial repayment becomes his optimal strategy. The optimal strategy assumes that the typical borrower will strive to minimize his monthly payments. However, for some households, reducing total debt in a shorter period is a more attractive option. In conclusion, the following regularity can be formulated. If the borrower is unable to refinance the mortgage, the lower the outstanding balance, the greater the probability of the loan being partially paid off.

Partial payoffs or curtailments are a direct effect of the mortgagor utility maximization choices (Chinloy, 1993). This situation reveals some important information about true wealth, borrower's financial stability, saving or consumption habits, and others not measurable during the origination process. This type of prepayment successively shortens the loan period and decreases the Loan to Value ratio, and therefore the probability of default. Curtailment behavior provides information on the mortgagor incentive to prepay.

First, the situation when the borrower can make extra payments is an implication of income capacity exceeding initial requirements and therefore prepayment. In this case, the mortgagor can manage a temporary reduction of income or job loss. On the other hand, it also means that it is more likely to obtain another mortgage loan and in case of decreasing market interest rates to refinance.

Second, the fact that debtor is willing to save an extra income and use it to pay off liability is an indication that the utility of relief from debt is higher than of additional consumption (Lin & Yang, 2005). If that was the case in the past it is more likely to reoccur in the future, which will cause gradual shortening of mortgage life.

Last but not least, the extra funds' allocation on loan account suggests that the borrower’s financial situation is stable and is less likely to face income fluctuations. Households who experience the changes in income pay more attention to liquidity and put any extra money in more liquid assets. In the case of income problems they easily can cash out these assets and obtain necessary money. If the excess income is used to partially payoff the mortgage debt, it is an indication of not needing to regain that money. Such a process, in case of a loan, requires more time than the household could afford and associates with transaction costs.

Full payoffs are usually a result of a property sale or a part of the refinancing process. Most mortgages cannot be taken over with the sold property, therefore it needs to be paid off first. This type of payoff typically corresponds with job relocation, adjustments of property size, or changes in

household income and is not correlated with other households due to its nature. On the other hand, refinancing driven payoff usually occurs when market interest rates drop significantly below the current mortgage loan interest rate. This type of payoff characterizes a high correlation among all households in a country.

CONCLUSION

To sum up, prepayment occurs when the property is put up for sale, then the mortgage must be paid off completely if the new homeowner does not take the mortgage over with the property. The loan holder may be able to refinance at a lower cost, for example when interest rates drop. The borrower may not be able to meet his monthly payments, resulting in the foreclosure process and sale of the property. Prepayment can also occur when the owner of a mortgage loan begins to earn more and those additional funds are being used for earlier repayment of the liability. There may also be a situation that the property is destroyed, and then the mortgage loan is paid off using insurance settlement money.

Prepayment risk for mortgage banks, as shown should be a big part of risk assessment. Banks in Poland should follow the knowledge accumulated by the west institutions regarding prepayment behavior. It is always referred to as the rising interest rates determine if banks can make a profit. This is true if we look at the interest rates as the risk for the borrowers of not being able to pay back or as affordability to buy a property. More accurate would be taking a look at the bigger picture. Banks should not only focus on current and projected interest rates but also on the current and projected level of refinancing rates, as the most common reason for the prepayment is refinancing the loan. The refinance rate incorporates the level of market interest rates but take also into consideration the interest rates of already originated mortgage loans. The declining interest rates cause the borrower refinancing initiative to rise. It is in the interest of the mortgage bank that the level of refinancing rates exceeds the interest rate on mortgage loans. Such a condition will limit, but will not eliminate the risk of prepayment. Limiting the number of prepayments will mean that the average loan age will be much larger, thus allowing for longer profits from the ownership of credit in the portfolio. Mortgage organizations that assess the interest risk should expand that process and look at a more complex problem where interest rates are present which is prepayment risk. The banks should not try to limit the prepayment risk by setting up prepayment penalties but need to create a process for prepayment risk assessment.

Increasing property prices and growing banking industry will cause further development of the real estate market. The growth of the mortgage market and the formation of new banking products will make the mortgage loan more and more available to borrowers. For the bank, this means greater risk and more factors that must be taken into account in the process of the risk assessment. Undoubtedly, the phenomenon of prepayment will continue and even become much significant due to more liberal legal regulations, increased mobility of people, and technological development. This makes the problem of prepayment risk more complex.

It is obvious, that further research, more empirical, is needed to find which experiences of the US Mortgage loan market apply in Polish reality. Certainly, not all of them will find references on the Polish market, which differs not only in its maturity but also in different types of mortgage products, its characteristics, banking policies, and laws.

REFERENCES

Hayre, L. & Young, R. (2001). Anatomy of Prepayments: The Salomon Smith Barney Prepayment Model. In W L. Hayre (Ed.), *Salomon Smith Barney Guide to Mortgage-Backed and Asset-Backed Securities* (pp. 132-171). New York: John Wiley & Sons, Inc.

Allman, K. A. (2007). *Modeling Structured Finance Cash Flows with Microsoft Excel: A Step-by-Step Guide*. New Jersey: John Wiley & Sons, Inc.

Boheim, R. & Taylor, M. (2000). My Home was my Castle: Evictions and Repossessions in Britain. *Journal of Housing Economics*, 9(4), 287-319. https://doi.org/10.1006/jhec.2001.0271.

Chan, S. (2001). Spatial Lock-in: Do Falling House Prices Constrain Residential Mobility? *Journal of Urban Economics*, 49(3), 567-586. https://doi.org/10.1006/juec.2000.2205.

Chinloy, P. (1993). Elective Mortgage Prepayment: Termination and Curtailment. *Real Estate Economics*, 21(3), 313-332. https://doi.org/10.1111/1540-6229.00613.

Cutts, A. C., & Merrill, W. A. (2008). Interventions in Mortgage Default: Policies and Practices to Prevent Home Loss and Lower Costs. *Borrowing to Live: Consumer and Mortgage Credit Revisited*, 203-254. http://www.jstor.org/stable/10.7864/j.ctt1262m3.11.

Deng, Y., Quigley, J., & Van Order, R. (2000). Mortgage Terminations, Heterogeneity and the Exercise of Mortgage Options. *Econometrica*, 68(2), 275-308. https://doi.org/10.1111/1468-0262.00110.

Fabozzi, F. J. (2007). *Fixed Income Analysis*. New Jersey: John Wiley & Sons Inc.

Fabozzi, F. J., Bhattacharya, A. K., & Berliner, W. S. (2010). *Mortgage-Backed Securities: Products, Structuring, and Analytical Techniques*. New Jersey: John Wiley & Sons.

Gan, J. (2009). *Burnout from Pools to Loans: Modeling Refinancing Prepayments as a Self-selection Process*. MPRA Paper 15596, University Library of Munich, Germany.

Green, J., & Shoven, J. B. (1986). The Effects of Interest Rates on Mortgage Prepayments. *Journal of Money, Credit and Banking*, 18(1), 41-59. https://doi.org/10.2307/1992319.

Hakim, S. R. (1997). Autonomous and Financial Mortgage Prepayment. *Journal of Real Estate Research*, 13(1), 1-16.

Krainer, J., & Laderman, E. (2011). Prepayment and Delinquency in the Mortgage Crisis Period. *Federal Reserve Bank of San Francisco, Working Paper Series.*

Lin, C.-C. & Yang, T. T. (2005). Curtailment as a Mortgage Performance Indicator. *Journal of Housing Economics*, 14(3), 294-314. https://doi.org/10.1016/j.jhe.2005.07.005.

McCollum, M. N., Hong, L., & Pace, R. K. (2015). Deleveraging and Mortgage Curtailment. *Journal of Banking & Finance*, 60, 60-75. https://doi.org/10.1016/j.jbankfin.2015.06.019.

Ngai, L., & Tenreyro, S. (2014). Hot and Cold Seasons in the Housing Market. *American Economic Review*, 104(12), 3991-4026. https://doi.org/10.1257/aer.104.12.3991.

Peters, H. F., Pinkus, S. M., & Askin, D. J. (1984). Figuring the Odds: A Model of Prepayments. *Secondary Mortgage Markets*, 1(2), 18-23.

Quigley, J. M. (1987). Interest Rate Variations, Mortgage Prepayments and Household Mobility. *The Review of Economics and Statistics,* 69(4), 636-643. https://doi.org/10.2307/1935958

Rose, M. J. (2013). Geographic Variation in Subprime Loan Features, *Foreclosures and Prepayments,* 95(2), 563-590. https://doi.org/10.1162/REST_a_00256.

Schultz, G. M. (2016). *Investing in Mortgage-Backed and Asset-Backed Securities. Financial Modeling with R and Open Source Analytics + Website*. New Jersey: John Wiley & Sons Inc.

Wyrzykowski, P. (2011). Ryzyko kredytowe & sposoby jego zabezpieczenia w przypadku kredytów mieszkaniowych (na przykładzie Banku X w latach 2008–2011). *Zeszyty Naukowe SGGW w Warszawie. Polityki Europejskie, Finanse i Marketing*, 7(56), 146-164.