Article

Macroeconomic Determinants of Credit Risk: Evidence on the Impact on Consumer Credit in Central and Eastern European Countries

Rasa Kanapickienė [1,*], Greta Keliuotytė-Staniulėnienė [1], Deimantė Teresienė [1], Renatas Špicas [1] and Airidas Neifaltas [1,2]

[1] Department of Finance, Faculty of Economics and Business Administration, Vilnius University, 10222 Vilnius, Lithuania
[2] Faculty of Mathematics and Informatics, Vilnius University, 03225 Vilnius, Lithuania
* Correspondence: rasa.kanapickiene@evaf.vu.lt

Abstract: Although empirical studies show that different types of loans have different risks (moreover, consumer credit risk is higher compared to other types of loans), it is common to study the credit risk of the banking sector as a whole, or of an individual bank's whole loan portfolio, and the macro-economic factors affecting it (without grouping them by type of loan). Thus, an analysis of the credit risk of the whole loan portfolio (measured by all non-performing loans) is insufficient. Therefore, the aim of this research is to identify the macroeconomic determinants of the consumer loan credit risk and quantitatively assess their impact in Central and Eastern European countries. After the analysis of scientific literature in the field of credit risk determinants, a detailed classification of factors influencing banking credit risk is proposed. The distinguishing feature of the classification is that the factors influencing credit risk are classified at five different levels; twelve groups of general macroeconomic conditions variables were selected as the potential factors of NPLs. This classification can be useful to better understand and investigate the factors influencing banking credit risk for the whole loan portfolio (in the same way as the factors that affect the credit risk of different types of loans, e.g., consumer loans). Using the methods of constant, fixed and random-effects panel analysis, simple OLS, least squares with breakpoints regression analysis and Markov regime-switching models, the impact of the macroeconomic variables from twelve separate groups is evaluated. The data from 11 CEE countries are used, and the period from 2008 to 2020 is covered. The results of this assessment reveal that in the group of CEE countries, such variables as GDP and labour market variables appeared to have contributed to the increase in the share of non-performing consumer loans, while inflation and real estate market variables were related to the decrease in consumer NPLs; at the same time, the impact of variables form other groups appeared to be mixed-nature or insignificant. The results of this research are useful in that they allow the identification of the most important determinants of consumer loan credit risk and thus allow making assumptions about NPL changes due to the changing macroeconomic situation. In the case of Lithuania, this kind of study (assessment of macroeconomic determinants of consumer loan credit risk) was conducted for the first time. Consumer loan credit risk assessment is especially relevant in an increasing interest rate environment, and deeper analysis can help banks and other financial institutions to manage credit risk. On the other hand, a better understanding of the main influencing factors of the macroeconomic environment can help central banks and other official institutions take appropriate monetary and fiscal policy decisions to ensure a good credit transmission channel for sustainable economic growth.

Keywords: credit risk; consumer loans; non-performing loans; macroeconomic determinants

1. Introduction

In recent years, especially after the 2008 global financial crisis, as stated in the literature [1,2], much attention has been paid to the identification of factors that influence credit

risk. Among these factors, macroeconomic factors are emphasised, and the need for an analysis of their impact on credit risk is demonstrated both in theoretical analyses carried out and in empirical studies conducted. Credit risk assessment is very important in creating sustainable economics. Sustainability issues are very sensitive to funding possibilities, which are at the same time related to credit risk. Because of that, it is essential to analyse the main factors having a significant influence on credit risk to take the right monetary and fiscal decisions, which can help ensure better transmission of credit channels. Credit risk analysis is very relevant during this economic period when the interest rates are increasing. Nowadays, central banks all over the world are increasing interest rates to manage inflation, so at the same time, commercial banks and other financial institutions have a big challenge in managing credit risk.

Firstly, after conducting theoretical credit risk analyses, the researchers emphasise the significance of macroeconomic factors. For example, (i) the importance of macroeconomic factors is presented by using various means of expression: "the macroeconomic environment is the most important factor in the determination of the credit risk" [3] and "the macroeconomic indicators are determinant factors that influence bank credit risk-taking decisions" [4]. (ii) The influence on credit risk is also stated. Castro [3] agrees that "the macroeconomic environment has a strong influence on banking credit risk". Similarly, Figlewski, Frydman, and Liang [5] show that "credit risk exposure is affected by conditions in the macroeconomy". Melecky and Sulganova [1] suggest that macroeconomic risk factors are a source of systemic risk.

Secondly, the performed empirical analyses also indicate that macroeconomic factors influence banking credit risk. For example, Mileris [4] points out that "favourable macroeconomic conditions coincide with better capabilities in loan repayment", as well as lower credit risk (i.e., lower probability of default (PD), a lower non-performing loans (NPLs) ratio, etc.). Additionally, conversely, the credit risk increases during economic downturns. Thus, credit risk is related to macroeconomic variables. After analysing empirical research by Demirguc-Kunt and Detragiache [6], Wong, Wong, and Leung [7] summarise that "systemic banking distress was associated with a macroeconomic environment of low economic growth, high inflation, and high real interest rates". Castro [3] concludes that "the economic environment is fundamental to explain the behaviour of the credit risk" and the "banking credit risk is significantly affected by the macroeconomic environment". Similar results have been obtained by other researchers, e.g., [8–12] and others. Finally, Castro [3] connects emerging banking crises to the changes in the economic environment and proclaims that "most of the banking crisis is preceded by changes in the economic environment that move the economy from a growth cycle to a recession".

After performing the analysis of conducted empirical research (Jiménez and Saurina [13], Bonfim [14], Nkusu [15] and others), the following conclusions have been drawn by Castro [3]: macroeconomic factors "should be included into the analysis since they have considerable influence on the changes of credit risk". Therefore, this is likely to be the reason, as the meta-analysis by Melecky and Sulganova [1] and Naili and Lahrichi [16] shows that the literature on credit risk determinants has been increasing, especially in the last decade.

Considering these reasons, researchers and policymakers widely discuss the banking credit risk [16]. Firstly, as noted by Koju, Koju, and Wang [17], empirical studies on credit risk determinants are essential for considering issues in a stable economy. Secondly, having in mind the significance of the bank sector on the economy, a lack of a systematic approach regarding credit risk factors is felt; thus, the issue of the classification of factors influencing the banking credit risk becomes important. Furthermore, on the one hand, results of the meta-analysis conducted by Melecky and Sulganova [1] suggest that, firstly, a limited number of studies are published before the 2008 global financial crisis, and, secondly, "the literature was fast-growing after 2010". On the other hand, a recent comprehensive literature review by Naili and Lahrichi [16] reveals that despite a large number of studies on

determinants of the banking credit risk, "the issue of NPLs remains unsolved". Therefore, this issue is still relevant.

It also needs to be noted that the majority of previous studies focused on the whole bank loan portfolio banking credit risk that is often measured using NPLs. However, the credit risk of different loans can be specific [13,18]; specifically, consumer loans have the highest NPLs [18], while research analysing separate types of loans is scarce and the level of examination of consumer loan credit risk is insufficient. Hence, such research remains relevant. In this study, we have selected the consumer loan credit risk to investigate. This decision was based on the fact that recently these loans are becoming the object of Fintech; moreover, during periods of uncertainty, the need for consumer loans increases. Thus, it is appropriate to carry out such research and reevaluate the results obtained in previous research. At the moment, credit risk assessment has become especially relevant because of the increasing interest rate environment and the high indebtedness of the household.

As noted above, the macroeconomic indicators are the most important factors that influence banking credit risk. However, the findings from the empirical literature are mixed. On the other hand, macroeconomic variables may impact each type of NPL in a different way. However, the level of examination of this issue is insufficient. These reasons motivate the need for more empirical research on the macroeconomic determinants of the banking credit risk of consumer loans.

It is worth mentioning that the scope of research also differs. Melecky and Sulganova [1] note that the majority of the studies "focus only on one country" and only some of them "use larger panels". Authors have been discussing the reasons behind this selection and have concluded that "this might be due to limited data availability and problematic international comparison, for instance, because of different definitions of non-performing loans in individual countries" [1].

This research, therefore, attempts to solve this issue by focusing on Central and Eastern European countries. In our opinion, this research is relevant as it analyses new EU countries. In these countries, not many comparative analyses have been carried out or have been carried out in previous periods. Moreover, the research did not deal with separate loan credit risks. In addition, it is appropriate to assess the influence of the challenges of the current year's economy on the banking credit risk.

In light of what has been said, this research aims to identify the macroeconomic determinants of the consumer loan credit risk in Central and Eastern European countries and to assess the impact of these determinants quantitatively.

In order to reach this aim, the following objectives have been set:

(i)   to develop the classifications of factors influencing the banking credit risk and the classification of macroeconomic factors influencing banking credit risk, considering the fact that there is no single approach to classifications of factors influencing the credit risk in theoretical studies and empirical research;

(ii)   to select macroeconomic factors having an impact on the credit risk in each group, having identified the groups of the factors influencing the banking credit risk (FIBCR); and

(iii) to develop the assessment models.

The most important contributions of this research are the following:

(i) In order to investigate the factors influencing credit risk, it is necessary to classify these factors at different levels. An analysis of the classifications of factors influencing credit risk in theoretical studies and empirical research has concluded that there is no single approach. Different trends can be identified, and a new classification is being developed on the basis of these trends. In this study, the classification of factors influencing banking credit risk is developed using a systematic approach.

A distinguishing feature of the classification is that the factors influencing credit risk are classified at five different levels. It is appropriate to underline that, at the second level, macroeconomic factors are often classified only as the factors influencing the systematic credit risk; therefore, we take a deeper approach and divide the factors influencing the systematic credit risk into three groups: (i) macroeconomic factors, (ii) changes in economic

policies factors, and (iii) and political changes factors. At the fourth level, we take a deeper approach and classify general macroeconomic conditions factors into twelve groups of the FIBCR; i.e., at this level, factors of (i) four different sectors are distinguished and (ii) eight groups of factors that affect all sectors. This classification may be useful to better understand and investigate the factors influencing banking credit risk for the whole loan portfolio (in the same way as the factors that affect the credit risk of different types of loans, e.g., consumer loans).

(ii) It is very important to mention that in previous studies, only a few commonly mentioned macroeconomic determinants of banking credit risk are analysed, and other potential determinants are left outside the scope of the research. This research focuses on the detailed classification of banking credit risk determinants.

Moreover, this research contributes to the literature in the field in the way that it investigates the determinants of banking credit risk focusing on one loan category—consumer loans. Such detailed analysis of the determinants of consumer loan credit risk has not been conducted in previous studies. In the case of Lithuania, this type of research is conducted for the first time.

In this research, the situation both in the group of CEE countries and in Lithuania separately was analysed and the impact of certain macroeconomic variables on consumer loan credit risk was identified. Using the methods of constant, fixed and random effects panel analysis, simple OLS, least squares with breakpoints regression analysis and Markov regime-switching models, it was revealed that: (i) for CEE countries, GDP and labour market variables appeared to have a risk-increasing effect, while inflation and real estate market variables had a risk-decreasing effect; (ii) in the case of Lithuania, real estate and labour market variables appeared to have a risk-increasing effect while GDP and household sector variables—a risk-decreasing effect on consumer loan credit risk.

Johnson, Boehlje, and Gunderson [19] agree that "if the implications of macroeconomic changes on loan default rates could be more accurately measured, lenders could better forecast future losses and the impact of losses on earnings". This means that a better understanding of the relationship between credit risk and macroeconomic factors could improve credit risk management in the banking sector. Therefore, the findings of this study can help to understand the causes of credit risk in analysed countries and enable commercial banks to sustain a competitive environment.

The results of this research allow the identification of the most important determinants of consumer loan credit risk making assumptions about NPLs changes due to the changing macroeconomic situation.

Moreover, the assessment of consumer loan credit risk is especially relevant in an increasing interest rate environment. On the one hand, deeper analysis can help banks and other financial institutions to manage credit risk. On the other hand, a better understanding of the main influencing factors of the macroeconomic environment can help central banks and other official institutions take appropriate monetary and fiscal policy decisions to ensure a good credit transmission channel for sustainable economic growth.

This paper consists of the introduction, four main sections, and discussion and implications as well as limitations and future research sections. In Section 2, the macroeconomic determinants of consumer loan credit risk are analysed theoretically and the classification of macroeconomic determinants is proposed; in Section 3, the selection of dependent and independent variables and hypotheses is discussed; in Section 4, the data selection and model specification is described, and in Section 5, the results of the quantitative assessment of the impact of macroeconomic variables on consumer loan credit risk are discussed.

2. Classifications of Factors Influencing Banking Credit Risk

To achieve the research aim, which is to identify the macroeconomic determinants of the consumer loan credit risk in Central and Eastern European countries, it is necessary to investigate the factors influencing credit risk and, in particular, to classify these factors at different levels. In this analysis, we do not limit our analysis to banking credit risk alone but

also use both country and enterprise credit risk studies. An analysis of the classifications of factors influencing credit risk in theoretical studies and empirical research has led to the conclusion that there is no single approach. Different trends can be identified, and a new classification is being developed on the basis of these trends.

Firstly, the components of credit risk are distinguished. Based on the literature, credit risk is generally classified into two components: (i) systematic credit risk and (ii) unsystematic credit risk. Given this breakdown, according to Castro [3], Mpofu, and Nikolaidou [20], it is appropriate to provide a similar breakdown of the factors influencing the banking credit risk (FIBCR) at the first level. Further, these factors are classified at several levels (see Figure 1).
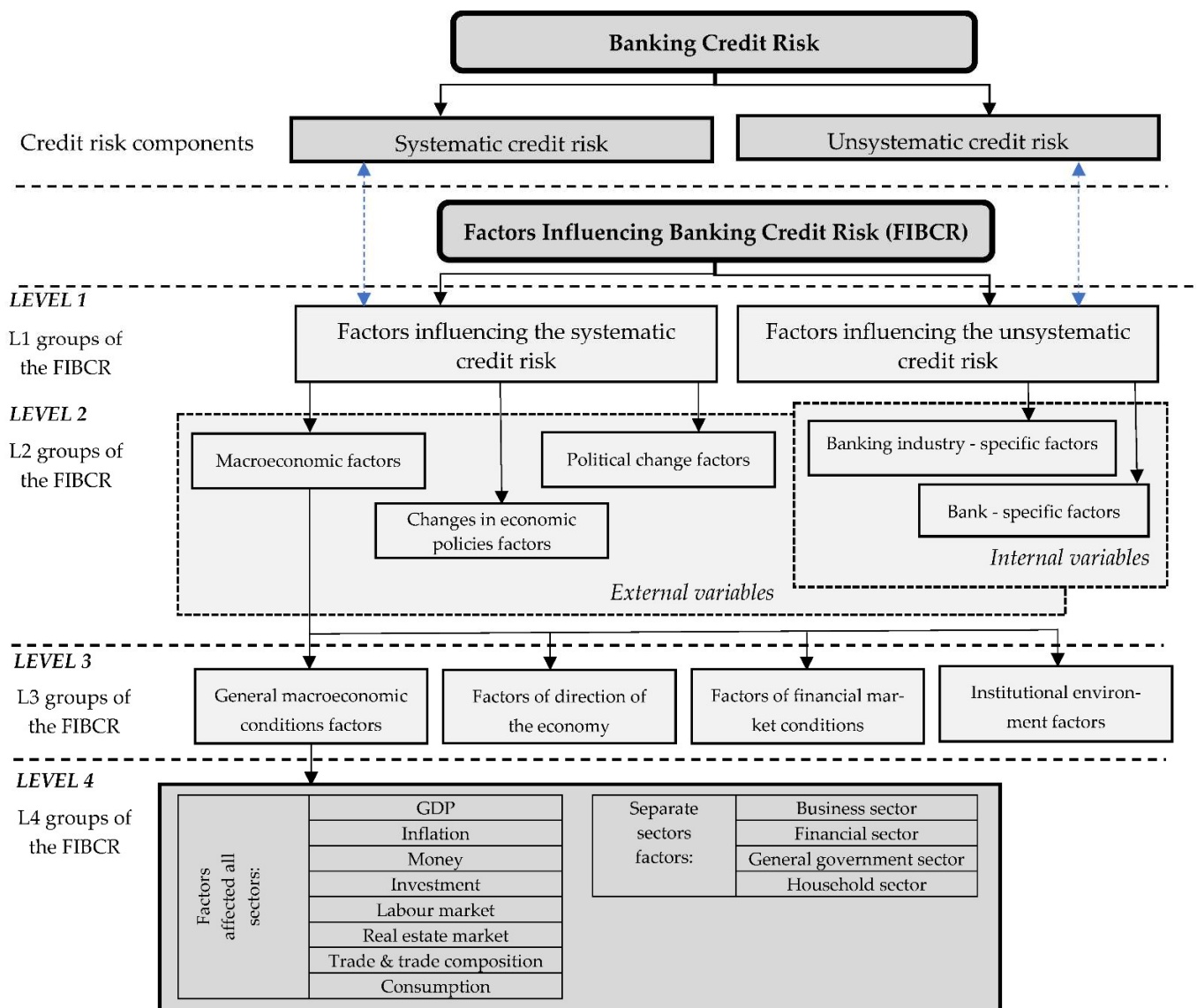
Figure 1. Classifications of factors influencing banking credit risk.

At the second level, groups of factors that characterise the factors influencing systematic and unsystematic credit risk are distinguished. It should be noted that the opinions of researchers differ. Different authors emphasize various characteristics of credit risk factors as the main characteristics. Further, some examples are provided.

(1) It is possible to distinguish a separate group of authors (e.g., [3,4,11,17,21]) who analyse only macroeconomic factors as the factors influencing credit risk.

A few studies should be mentioned separately. One of these is the study by Liao and Chang [22], which determines macroeconomic factors as economic and financial variables. Another study was performed by Maltritz and Molchanov [10]. According to researchers, (i) "the explanatory variables used in the literature can be divided into several groups"; (ii) "the largest group includes variables describing the country's macroeconomic conditions. On the other hand, for the study of country credit risk, Maltritz and Molchanov [10] include twenty-eight independent variables that describe (i) the country's macroeconomic conditions, as well as (ii) "some dimensions of countries' governance". However, the authors do not specify which variables belong to which group.

(2) It is possible to distinguish a separate group of authors analysing only bank-specific factors as the factors influencing credit risk. According to Naili and Lahrichi [16], this group includes researchers such as Boyd and De Nicoló [23], Podpiera and Weill [24], Rossi, Schwaiger, and Winkler [25], Haq and Heaney [26], and Zhang et al. [27]. Furthermore, Salas and Saurina [28] identify the bank-specific variables as microeconomic determinants of problem loans.

(3) Another group of researchers (e.g., [8,12,18,28]) distinguish two groups of factors, i.e., they examine the influence of both macroeconomic and bank-specific variables on credit risk. It should be noted that, in the case of firms rather than banks to be researched, the firm-specific factors are distinguished instead of the bank-specific variables group. For example, Figlewski, Frydman, and Liang [14] use macroeconomic and firm-specific ratings-related variables to explore how general economic conditions impact corporate defaults and major credit rating changes.

Furthermore, some authors present several different models in one study, e.g., to identify the main determinants of NPLs in the Euro-area banking system for the period 1990–2015, Dimitrios, Helen, and Mike [29] have developed six models that could be divided into three groups: (i) models that use only country-specific variables as macroeconomic factors; (ii) models that use only bank-specific variables, and (iii) models that use both country-specific variables and bank-specific variables.

(4) Ghosh's [30] theoretical analysis demonstrates that "most studies focus more on macroeconomic and external factors in influencing NPLs, and less on banking industry-specific factors," which shows the importance of these studies. For this reason, individual researchers (e.g., [31,32]) have distinguished between two groups of factors, i.e., examine the influence of macroeconomic and banking industry-specific variables.

(5) Researchers distinguish three groups of factors, i.e., macroeconomic, bank-specific, and banking industry-specific variables, e.g., Naili and Lahrichi [33].

In summary, it can be stated that it is possible to distinguish between different groups of authors who discuss three groups of the NPLs determinants: macroeconomic, banking industry-specific, and bank-specific determinants; or different combinations of these factors.

The literature also provides a different grouping of factors influencing credit risk. Further, some examples are provided.

(6) In addition to the groups of factors already mentioned, a group of financial market factors is distinguished. According to the findings by Gila-Gourgoura and Nikolaidou [2], the macroeconomic, bank-specific, and financial market variables affect credit risk that is measured in the flow of new bad loans (in the Italian banking system, 1997–2017). Naceur and Omran [34] and Mileris [4] distinguish four groups of determinants, including financial determinants. However, Mileris [4] uses only macroeconomic determinants in his empirical research and creates a set of independent variables as factors determining the changes in the amount of NPLs and doubtful loans calculated from 9 macroeconomic indicators for 22 EU countries in 2008–2010.

(7) A group of institutional environment factors is combined with other groups of factors. Several examples demonstrate this statement. Melecky and Sulganova [1] point out that several groups of credit risk determinants (i.e., macroeconomic, bank-specific or institutional determinants) can be identified; however, their paper only analyses the macroeconomic determinants of credit risk.

In addition to economic, financial, and bank-specific determinants, Naceur and Omran [34] and Mileris [4] distinguish determinants of the institutional environment.

(8) Research provides even a more comprehensive range of classifications, for example:

(a)　According to Castro [3], Mpofu, and Nikolaidou [20], the factors influencing systematic credit risk are divided into three groups (L2 groups in our classification): (i) macroeconomic factors (e.g., growth in GDP, employment rate, stock index, inflation rate, exchange rate movements), (ii) changes in economic policies factors, and (iii) political change factors.

(b)　Additionally, at the second level of classification, some researchers (e.g., [4,34,35]) combine factors into internal and external factors. According to Naceur and Omran [34] and Mileris [4], bank-specific determinants are classified as internal variables.

Suppose at the second level of classification, the groups can be classified. In that case, groups presented by the authors at the third level are even more unique; therefore, each classification is discussed separately.

(1)　The study by Liao and Chang [22] combines economic and financial variables into the following explanatory factors: (i) the real economy, (ii) inflation, and (iii) housing.

(2)　It should be noted that macroeconomic factors are grouped into three groups by Figlewski, Frydman, and Liang [5], and Mileris [4] as follows: (i) general macroeconomic conditions factors, (ii) factors of the direction of the economy and (iii) factors of the financial market conditions.

(3)　Feldkircher [36] divides macroeconomic determinants into six groups: (i) GDP and investment, (ii) money and inflation, (iii) monetary regime, (iv) trade and trade composition, (v) business environment and labour market, (vi) institutional quality.

(4)　After the literary analysis of the country's credit risk economic determinants, Maltritz and Molchanov [10] state that variables describing the country's macroeconomic conditions can be divided into the following groups: (i) general economic indicators, (ii) external relations indicators and (iii) variables that describe a country's debt situation.

To investigate the factors influencing banking credit risk (in the same way as the factors that affect the credit risk of different types of loans, e.g., consumer loans), it is necessary to classify these factors at different levels (see Figure 1). After analysing the classifications of factors influencing credit risk in theoretical studies and empirical research and identifying different trends, we develop the new classification based on abstraction, systematisation, and critical analysis.

Firstly, credit risk is distinguished into two components: (i) systematic credit risk and (ii) unsystematic credit risk. Given this breakdown, it is appropriate to provide a similar breakdown of the factors influencing the banking credit risk (FIBCR). Further, these factors are classified at several levels. At the first level, the factors are classified according to the components of the banking credit risk; i.e., there are two groups of factors: (i) the factors influencing the systematic credit risk and (ii) the factors influencing the unsystematic credit risk.

At the second level, groups of factors which characterise the factors influencing the systematic and unsystematic credit risk are distinguished. In this level of classification, often only macroeconomic factors are classified as the factors influencing the systematic credit risk; therefore, we take a deeper approach and divide factors influencing the systematic credit risk into three groups: (i) macroeconomic factors, (ii) changes in economic policies factors, and (iii) and political changes factors. As stated above, changes in variables in the second group (i.e., in "Changes in economic policies factors") and the third group (i.e., "Political changes factors") are difficult to examine; therefore, the researchers mainly "focus on the macroeconomic factors." Thus, at the second level, five L2 groups of the FIBCR are identified, three of which characterise the factors influencing the systematic credit risk and two of which characterise the factors influencing the unsystematic credit risk (see Figure 1).

On the other hand, at the second level, these factors can be grouped under another heading: (i) external variables and (ii) internal variables. In addition, depending on the

research approach, different groupings are possible here; i.e., (i) if we are analysing the credit risk of a specific bank, then banking industry-specific factors will be classified as external variables, but (ii) if we analyse the credit risk of the banking industry, banking industry-specific factors will be classified as internal variables.

After modifying the classifications introduced in the studies of Naceur and Omran [34], Figlewski, Frydman, and Liang [5], Mileris [4] (according to Naceur and Omran [34]), Melecky and Sulganova [1], at the third level, macroeconomic factors have been grouped into four L3 groups: (i) general macroeconomic conditions factors, (ii) factors of the direction of the economy, (iii) factors of the financial market conditions, and (iv) institutional environment factors.

At the fourth level, general macroeconomic conditions factors are separated into twelve L4 groups of the FIBCR; i.e., at this level, factors of (i) four different sectors are distinguished, i.e., factors of the business sector, financial sector, general government sector, and household sector, and (ii) eight groups of factors affected all sectors, i.e., economic growth, inflation, money, investment, labour market, real estate market, trade and trade composition, consumption.

Finally, fifth-level (L5) groups of general macroeconomic conditions factors are analysed in Section 3 in the discussion of the independent variables of the research.

3. Research Hypotheses

During the study, considering the empirical evidence from previous studies, the macroeconomic determinants of the consumer loan credit risk were identified, and their quantitative impact on the banking credit risk was assessed in Central and Eastern European countries. To achieve the research aim, which is to identify the macroeconomic determinants of the consumer loan credit risk in Central and Eastern European countries, it is necessary to investigate the factors influencing credit risk and, in particular, to classify these factors at different levels. In this analysis, we do not limit our analysis to banking credit risk alone but also use both country and enterprise credit risk studies.

Based on the analysis of the scientific literature and suggested detailed classification of macroeconomic factors influencing banking credit risk, our research methodology was formulated. The study consisted of two stages: dependent variables and independent variables were selected at first, and, secondly, the assessment models were compiled. The selection of dependent and independent variables and the research design are discussed below.

3.1. The Dependent Variables

Based on previous studies (for example, [3,8,11,12,15,20,21,31,35,37–39] and others), the non-performing loans for consumption-to-total loans ratio (NPLs) is selected as a proxy of banking credit risk, i.e., dependent variable (since for CEE countries the data of NPL for consumer loans are not available, the data for retail loans NPLs are used). In addition, to examine the relationship between macroeconomic factors of banking credit risk and credit volumes, an additional dependent variable (volume of loans for consumption) is included in this research (see Table A2, Figure A1).

3.2. The Independent Variables and Development of Hypotheses

Based on the literature analysis, twelve groups of the general macroeconomic conditions factors (hereinafter referred to as macroeconomic variables) were selected as the potential factors of the NPLs as well as NPLs for consumption. Their descriptions and the possible relationships with the NPLs are discussed below.

3.2.1. GDP Variables

Researchers focused on banking credit risk (e.g., [2,3,17,28]) have been discussing that the GDP variables are considered one of the main macroeconomic factors influencing credit risk.

GDP is one of the macroeconomic variables used "to represent the general economic environment" [40]. According to researchers, a growing economy is associated with rising incomes [15], which means that borrowers have a sufficient stream of income to repay their debts [31] and, as a result, financial distress decreases [15]. Consequently, GDP variables are negatively associated with NPLs [15,41]. Additionally, on the contrary, rising NPL is associated with adverse macroeconomic developments.

In scientific papers, researchers present different modifications of GDP used as macroeconomic variables. After analysing the literature, the following variables can be distinguished: (1) GDP [4,10,12,14,20,22,35,42], (2) real GDP [2,30,31,40,42,43], (3) GDP growth [2–4,10,16,17,20,30,31,38,42] (it should be noted that in empirical studies this variable is usually adjusted (i.e., GDP growth rate is often used)), (4) real GDP growth [4,30], (5) GDP growth rate [10,14,17,42], (6) real GDP growth rate (%) [3,4,20,30], (7) GDP per capita, [10,12,17,30], (8) GDP per capita growth rate [17,20], (9) real GDP per capita growth rate [10,30].

In this factor group, the following less commonly used factors are identified in scientific papers: (1) GDP gap (output gap) [2,30,42,43], (2) gross national income (GNI) that is measured as the gross national income (GNI) per capita growth rate (e.g., [17]), (3) gross national expenditure (GNE) (e.g., [17]). Only one of the GDP variables was usually used by the previous studies, whereas Koju, Koju, and Wang [17] argue that their study is among the limited studies that analyse different GDP proxies in a single paper. In this study, we will follow the approach of these authors and analyse different GDP proxies in different models to determine which indicator best explains NPLs.

Researchers highlight the link found between GDP indicators and credit risk. However, the authors differ in the level of detail they provide. The level of detail ranges from the abstract presentation, for example, stating that "the level of NPLs is influenced by GDP growth" (Gila-Gourgoura and Nikolaidou [2] (as cited by Klein [40]) to a detailed presentation, i.e., indicating the direction of the link and/or whether the link is significant. Furthermore, some examples are provided.

(1) The results of correlation analysis indicate the following conclusion. Gila-Gourgoura and Nikolaidou [2] (as cited by Makri et al. [44]) declare strong correlations between NPLs and GDP. Meanwhile, Mpofu and Nikolaidou [20] (as cited by Ombaba; Viswanadham and Nahid) go into more detail: a negative correlation is stated between NPLs and GDP.

(2) Researchers document a significant impact of GDP variables on credit risk. For example, Nikolaidou and Vogiazas [31], according to Castro [3], state a significant impact of GDP growth on banks' credit risk. Karoglou, Mouratidis, and Vogiazas [43] cite Hoggarth et al. and point out that "real GDP has a significant impact on loan portfolio quality" (the case of the UK).

(3) Researchers document a negative influence of GDP variables on credit risk, e.g., [30,35,45]. Some authors emphasise the length of the impact, e.g., "GDP growth reduce credit risk in the long run" [46], "GDP per capita growth rate was significantly related to credit risk in the short-run" [11].

(4) Researchers document a significant negative influence of GDP variables on credit risk. Mpofu and Nikolaidou [20], based on the studies [8,15,21,37], point out that real GDP growth rate has a significant negative relationship with NPLs. The empirical findings show that GDP variables (GDP per capita growth rate [11], GDP growth rate [17], and real GDP growth rate [20]) have a negative and significant relationship with NPLs.

(5) However, Haniifah's [38] findings show that GDP growth is insignificant in influencing NPLs (the case of Uganda, 2000–2013).

Within the group of less frequently used factors, research papers highlight the following relationships between factors and credit risk:

(1)   The GDP gap (output gap) is distinguished as a significant explanatory variable [2,29]: the probability of default decreases when the GDP gap increases [42]. Moreover, this factor significantly negatively impacts the quality of the loan portfolio [35].

(2)   The gross national income (GNI) per capita growth rate has a significant negative impact on NPLs [17].

(3)   The effect of gross national expenditure (GNE) on the NPLs level is negative, although not statistically significant [17].

In summary, according to the results obtained by most researchers, GDP variables are expected to have a negative relationship with NPLs. Based on these arguments, Hypothesis 1 is formulated:

Hypothesis 1 (H1): *GDP variables are significantly negatively related to the NPLs.*

3.2.2. Inflation Variables

Previous studies addressed to economic factors of credit risk [12,17,30,32,43] show that inflation, as an economic factor, has a strong impact on credit risk, more specifically on NPLs. As Koju, Koju, and Wang [17] state, inflation is a proxy of monetary policy and, in general, measures the increase in the price level. On the one hand, one of the most frequently used measures of inflation is the consumer price index (CPI) which measures prices from the perspective of consumers. In contrast, the producer price index (PPI) measures prices from the perspective of industries.

According to the literature analysis, researchers use (i) the consumer price index (CPI) [2,12,17,22,24,39,42,47,48] and (ii) the producer price index (PPI) [12,22,40,42]. Lastly, it is possible to identify a group of researchers who do not specify measures of inflation [1,2,4,10–12,17,19,20,31,33,35,38,42,43,49].

The impact of inflation on NPLs requires further research; therefore, previous empirical findings "are ambiguous" [20,41] and "inflation effect on credit risk is not clear" [1,47].

The findings of studies have been mixed; i.e., the impact of inflation on NPLs reported by researchers is (i) significant negative, e.g., [1,50,51], (ii) negative but statistically insignificant, e.g., [38], (iii) significant-positive, e.g., [20,30], (iv) positive but statistically insignificant, e.g., [17], (v) insignificant, e.g., [12,52,53].

Regarding the household loan portfolio, inflation is a significant indicator of NPLs. However, the findings of studies have been mixed; i.e., the impact of inflation on NPLs can be both (i) significant negative, e.g., Kjosevski, Petkovski, and Naumovska [51] (Macedonia, 2003–2014) and (ii) significant-positive, e.g., Abid, Ouertani, and Zouari-Ghorbel [54] (Tunisia, 2003–2012).

Finally, it is worth distinguishing the GDP deflator as an inflation indicator. Researchers also provide mixed perceptions on the GDP deflator. Harada and Kageyama [40] find this macroeconomic variable to be significant ([40] (as cited by [42])). A few observations will also be made on the other empirical studies mentioned above. Liao and Chang [22] use "two variables contained in the inflation component", i.e., the consumer price index (CPI) and producer price index (PPI). Meanwhile, the GDP deflator is examined as the fundamental economic component of three other components (industrial production, unemployment, and personal income). The study reveals that the GDP deflator significantly and positively impacts the fundamental economic component. Furthermore, it "negatively impacts default intensities and raises survival probabilities".

To summarise, on the one hand, inflation could have a negative effect on NPLs. Koju, Koju, and Wang [50], Umar and Sun [41], Nor, Ismail, and Abd Rahman [53] explain this relationship as follows: if the nominal interest rate remains unchanged and inflation increases, the value of the loan decreases. Therefore, this makes it easier for borrowers to repay their loans; hence, the default risks of borrowers decrease, and the NPLs decrease.

On the other hand, Mileris [4] argues that usually high inflation rate is associated with high loan interest rates and hence, high bank incomes. However, as the loan interest rates rise, the ability of borrowers to service their loan payments on time decreases (Umar and

Sun [41]; Koju, Koju, and Wang [17], Kjosevski and Petkovski [47]). Thus, based on this argument, the inflation rate is assumed to affect NPLs positively.

In this research, the inflation variables are expected to have a negative relationship with NPLs. Based on these arguments, Hypothesis 2 is formulated:

Hypothesis 2 (H2): *Inflation variables are significantly negatively related to the NPLs.*

3.2.3. Money Variables

Researchers discuss that the quality changes in bank loan portfolios depend on money supply [4]. Money supply as a determinant of the NPLs is used (i) in the theoretical background for empirical analysis, e.g., by Mileris [4], Nikolaidou and Vogiazas [55], Nikolaidou and Vogiazas [31], Gila-Gourgoura and Nikolaidou [2], and (ii) in empirical research, e.g., Nikolaidou and Vogiazas [56], Nikolaidou and Vogiazas [31], Karoglou, Mouratidis, and Vogiazas [43]. However, the findings of the studies are mixed. Further, some examples are provided. Empirical results by Karoglou, Mouratidis, and Vogiazas [43] indicate that the money supply negatively impacts the credit risk of both Romania and Bulgaria. It should be noted that, in the case of Bulgaria, credit risk is measured by the growth rate of the ratio of loss and doubtful loans to total loans (DNPL). The growth rate of the ratio of loss and doubtful loans to total loans (DNPL) is a credit risk proxy in the case of Romania. Nikolaidou and Vogiazas' [56] findings show that money supply (M2) as a macroeconomic activity factor has had a negative and significant impact on Romania's credit risk both in the long and the short run over the period of 2001–2010. In this case, the credit risk is measured as the loan loss provisions-to-total loans. Nikolaidou and Vogiazas [31] reveal that money supply (M1, M2, M3) has a decreasing, i.e., negative, effect on the NPLs in Sub-Saharan Africa (SSA) countries' banking systems (M1 for Zambia, M2 for Kenya, South Africa, and Namibia, and M3 for Uganda) in both the long and short run. The findings of Yurdakul [46] suggest that money supply (M2) increases banks' credit risks (Turkey, 1998–2012); i.e., the impact of money supply on the NPLs is positive but statistically insignificant.

International reserves are another variable discussed by researchers. While analysing the country's credit risk, Maltritz and Molchanov [10] state that foreign exchange reserves "are often seen as a buffer for shocks in current and capital accounts." Consequently, they are considered to be an essential determinant of the country's default risk.

International reserves as a macroeconomic factor are used in various contexts. For example, (i) Feldkircher [36] employs this factor when identifying financial and macroeconomic market conditions helping to explain the distinct response of the countries' real economies to the global financial crisis. Nonetheless, the authors did not find a direct relationship between reserve accumulation and the severity of the crisis. However, summarising the results, Feldkircher [36] states that "the accumulation of international reserves mitigated the harmful effects of financial stress on the real economy, in particular when domestic funding via credit is abundant." (ii) Analysing the political and economic determinants of country credit risk in both emerging and developed economies, reserves are used as an external relations indicator by Maltritz and Molchanov [10]. They conclude that the impact of the ratio of foreign exchange reserves to imports on the developing countries' default risk is significantly negative. (iii) Having analysed determinants of sovereign credit risk, Stolbov [48] concludes that, in the case of analysis, higher foreign reserves reduce the sovereign credit risk; these findings are consistent with the economic theory. However, this effect only occurs in the short run.

In this research, the money variables are expected to have a negative relationship with the NPLs. Based on these arguments, Hypothesis 3 is formulated:

Hypothesis 3 (H3): *Money variables are significantly negatively related to the NPLs.*

3.2.4. Investment Variables

In a theoretical analysis of the economic and political determinants of the country's credit risk, Maltritz and Molchanov [10] investigated the statistically significant negative effect of the investment ratio on the country's default risk found in previous studies. It should be noted that the investment ratio is measured as the capital-investment-to-GDP. In empirical research, Maltritz and Molchanov [10] use both the capital investment-to-GDP and the investment freedom factors; however, their empirical research findings show that the effect of these factors on the country's credit risk is negative but statistically insignificant. Mileris [4] uses the "gross fixed capital formation" factor measured as Capital investment per capita. Based on the above, we propose to identify the following factors in the group of investment factors: (i) gross fixed capital formation (i.e., capital investment per capita), (ii) capital-investment-to-GDP, and (iii) investment freedom.

To conclude, in this research, the investment variables are expected to have a negative relationship with the NPLs. Based on these arguments, Hypothesis 4 is formulated:

Hypothesis 4 (H4): *Investment variables are significantly negatively related to the NPLs.*

3.2.5. Labour Market Variables

Unemployment rate as a determinant of credit risk is distinguished (i) in theoretical analyses, e.g., Melecky and Sulganova [1]; (ii) in the theoretical background for empirical analysis, e.g., [2,4,16,17,20,31] and others; and (iii) in empirical studies, e.g., [2,3,15,17,18, 30,32,42–46,51,56–63] and others.

Melecky and Sulganova [1] carried out a detailed theoretical study. The authors examined 33 studies that include 92 models and almost 300 estimated parameters, as well as the "five most common macroeconomic" determinants of NPLs ratio, one of which is the unemployment rate. Though this variable is relevant, it "is not included in more than half of the models" considered by researchers. According to Melecky and Sulganova [1], a meta-analysis of empirical literature shows that the studies are dominated by "the positive and statistically significant estimated parameters" of the unemployment rate; furthermore, there is "a relatively larger share" of studies that have insignificant estimates.

Researchers emphasise the relationship between unemployment and credit risk. However, they present different levels of detail. On the one hand, studies can provide an abstract presentation. For example, the results show that the NPLs can be explained mainly by macroeconomic variables, including the unemployment rate [18,59,62–64]. On the other hand, studies can provide a detailed presentation, i.e., indicating the direction of the relationship and/or whether the relationship is significant. Some examples are given below.

(1) Researchers document a significant-positive impact of unemployment on credit risk; i.e., credit risk rises when the unemployment rate increases [2,3,15,17,31,43,45,46,52,60,64–66].

The positive impact of unemployment on non-performing loans could be explained from two perspectives. From the perspective of employees, the explanation could be the following: the probability of default depends on the current income [18] as unemployment negatively affects the cash flows of households and increases the debt burden [45]; unemployed persons cannot meet their commitments and repay the loans [17,45]; in consequence, this could increase the level of non-performing loans. In addition, it should be noted that an increase in the unemployment rate limits the current and future income of households. From the perspective of enterprises, the explanation could be the following: the rise in unemployment could lead to a decline in the production of enterprises due to the decline in effective demand [45]. It has a negative impact on enterprises' economic activities and stimulates credit risk [42]. Finally, Kocisova and Pastyrikova [63] expand the perspective to the state level and suggest that if the country does not create jobs, it affects not only "the banking sector in the form of high NPL but also the whole economy".

(2) Researchers document a significant positive impact of unemployment on credit risk with a time lag. For example, Nikolaidou and Vogiazas [56] present that unemployment significantly positively impacts NPLs with a 10-month lag. According to the study by Sulganova [57], a significant-positive relationship between the unemployment rate and the NPLs is found after a longer period of about two years.

Blanco and Gimeno [67] explain the existence of time lags; i.e., unemployment benefits, personal savings, or financial support from other family members can help unemployed borrowers repay their loans in the short term. Thus, it could take some time before loans granted to unemployed borrowers will be classified as NPLs.

(3) Some studies confirm the negative impact of unemployment on credit risk, e.g., [56]. Likewise, the research of Zheng, Bhowmik, and Sarker [32] suggests that this macroeconomic variable has a negative connection with the NPLs (Bangladesh, 1979–2018) in the long run; however, in the short run, unemployment has a significant-positive relation with the NPLs; i.e., "a 1% increase in unemployment will cause a 2.45% decrease in bad loans".

(4) Researchers document an insignificant impact of unemployment on credit risk, e.g., [61].

Finally, it should be noted that to estimate unemployment; researchers also use the long-term unemployment rate (e.g., Mileris [4]). Therefore, it is reasonable to assess the impact of this variable in empirical research.

We rely on the provision that increasing unemployment leads to the loss of income for employees, and this contributes to an increase in non-performing loans. It means that the unemployment variables are expected to have a positive relationship with the NPLs. Based on these arguments, Hypothesis 5 is formulated:

Hypothesis 5 (H5): *Unemployment variables are significantly positively related to the NPLs.*

3.2.6. Real Estate Market Variables

Economists agree that the real estate market usually takes a significant part of the country's economy. As Liao and Chang [22] state, housing market variables could be used to identify the relationship between the housing bubble and the credit crisis. As mentioned above, in the L4 group of the FIBCR named "real estate market", we suggest including the following factors: (i) house price index (HPI) and (ii) real estate prices. The assumptions underlying this selection are given below.

House Price Index (HPI) is used as a macroeconomic conditions factor in research [3,15,20,22,42]. The research results by these authors indicate that the house price index significantly negatively affects the default risk [22] or credit risk [3]; i.e., this risk increases when housing prices decrease [3]. The following phenomenon explains this. As housing prices increase, the value of collateral increases [3], the "borrowers face unexpected adverse shocks" [15], and the likelihood of borrower default reduces, as well as the banking credit risk. Conversely, as Liao and Chang [22] discuss, the lower house prices make the process of refinancing mortgage loans more difficult and increase foreclosure and delinquency rates.

In this research, the real estate market variables are expected to have a negative relationship with the NPLs. Based on these arguments, Hypothesis 6 is formulated:

Hypothesis 6 (H6): *Real estate market variables are significantly negatively related to the NPLs.*

3.2.7. Trade and Trade Composition Variables

Among the variables describing the country's macroeconomic conditions, it is appropriate to distinguish the external relations indicator group [10]. In the country credit risk analysis, Maltritz and Molchanov [10] agree that the variables related to the real side of the balance of payment (such as exports, imports, trade balance, or current account) are important. Authors explain this by stating that "(net) capital exports (for debt servicing) are mirrored by real transactions, e.g., (net) exports of goods and services." These indicators

are expected to be significant when researching banking credit risk. Therefore, we consider it to be appropriate to separate the following trade and trade composition variable groups: (1) exports, (2) imports, (3) trade balance, and (4) other factor groups. The reasoning behind this division is presented hereinafter.

Firstly, as Koju, Koju, and Wang [17] explain, a high volume of exports indicates the efficient trade policy expected to improve a country's economic growth, herewith the borrowers' financial position. Hence, it indicates that export is negatively linked to the NPL level. The trade openness policy could be proxied by different variables used by researchers: (a) the exports of goods and services per capita [4], (b) the exports of goods and services to GDP [17], or (c) the export growth rate [10].

Secondly, imports could be proxied by different variables used by researchers: (a) the imports of goods and services per capita [4], (b) the imports of goods and services to GDP, or (c) the imports growth rate [10]. Maltritz and Molchanov [10] reveal that the effect of the import growth rate on the country's default risk is significantly negative in developed countries and, in contrast, positive but statistically insignificant in emerging economies.

Thirdly, in the trade balance group, the following variables are suggested to be included: (a) the current account balance [2,4,17], (b) the trade balance [2], and (c) the trade-balance to GDP [10]. Koju, Koju, and Wang [17] obtain that the impact of the current account is not significant. Maltritz and Molchanov [10] reveal that the effect of the trade-balance-to-GDP variable on the country default risk is mixed; i.e., this effect is positive but statistically insignificant in developed countries—in contrast, it is negative but statistically insignificant in emerging economies.

Finally, the empirical study by Maltritz and Molchanov [10] shows that developed countries' default risk is significantly and positively influenced by the trade freedom variable; despite this, the effect of this variable is positive but statistically insignificant in emerging economies.

To summarise, the findings of studies have been mixed. Therefore, the trade and trade composition variables are expected to have an insignificant relationship with the NPLs. Based on these arguments, Hypothesis 7 is formulated:

Hypothesis 7 (H7): *Trade and trade composition variables are insignificantly related to the NPLs.*

3.2.8. Consumption Variables

Within this group, we propose to identify the following factors: (i) consumer confidence index [49] or consumer sentiment index [5] (since the results using these indexes are quite similar, we employ and report on only the consumer confidence index), (ii) retail sales, and (iii) final consumption expenditure of households per capita [4]. On the one hand, as Figlewski, Frydman, and Liang [5] state, the change in consumer sentiment as the variable related to macroeconomic conditions is negative and highly significant for corporate transitions into default. On the other hand, Doshi, Jacobs, and Zurita [49] analyse the consumer confidence index as determining the country's default intensity. Researchers document that the spread decreases as a function of the consumer confidence index; i.e., this influence is significantly negative. These examples reveal that the research was carried out on the level of companies and the country; therefore, analysing the dependence on the bank sector level is engaging and appropriate.

To conclude, in this research, the consumption variables are expected to have a negative relationship with the NPLs. Based on these arguments, Hypothesis 8 is formulated:

Hypothesis 8 (H8): *Consumption variables are significantly negatively related to the NPLs.*

3.2.9. Business Sector Variables

While the macroeconomic condition factor groups (in our research indicated as L4 groups of the FIBCR) discussed above are quite widely analysed in scientific literature, the following factor groups and separate factors have been analysed in fragments and

these factors have not been systemised. Some of the suggested factors were analysed at the country credit risk level or the corporate credit risk level. Thus, it is significant to reveal the impact of these macroeconomic factors at the banking credit risk level.

At the fourth level, the macroeconomic condition factors defining different sectors are divided into four L4 groups of the FIBCR, i.e., (i) business sector, (ii) financial sector, (iii) general government sector, and (iv) household sector factor groups. At the fifth level, two L4 groups defining the separate sectors (specifically, the factor groups of the business sector and general government sector) are distinguished into sub-groups, i.e., the L5 groups of the FIBCR. Hereinafter the aforementioned groups and factors will be discussed in greater detail.

In the business sector, it is worth distinguishing the following sub-groups (i.e., the L5 groups of the FIBCR): (1) general, (2) primary sector and secondary sector, (3) tertiary and quaternary sectors, (4) other. Factors included in the general group are common to the whole business sector. The two other groups are intended for separate sectors of the economy. Factor "business freedom" is allocated to the factor group named "other". The division of individual factors into L5 groups of the FIBCR can be seen in Figure A1. Hereinafter the separate factors will be discussed in detail.

(a) Fraction of defaulting firms in the economy. Mileris [4] notes that individual default probabilities of companies and default rates (measured as the fraction of defaulting firms in the economy) are greatly correlated as both variables are clearly related to the business cycle. Hence, an increase in the fraction of defaulting firms in the economy can be expected to lead to an increase in the NPLs; i.e., the impact of the fraction of defaulting firms in the economy on the NPLs is positive.

(b) Business indebtedness. After the analysis of the macroeconomic determinants of banking sector distresses, Pesola [68] reveals that high customer indebtedness contributed to the distress in the banking sector. However, in Pesola's [68] study, the private "indebtedness indicator covers both the corporate and household sectors". On the other hand, in order to reveal the separate impact of the business sector and household sector, the indebtedness indicator has to be divided into two components: household indebtedness and business indebtedness, which we suggest measuring by the debt-to-equity ratio or business-loans-to-GDP ratio, respectively.

It is expected that the impact of the business sector indebtedness on the NPLs is positive: high indebtedness makes borrowers "more vulnerable to adverse shocks affecting their wealth or income, which raises the chances that they would run into debt servicing problems" [3,15].

(c) Industrial production index. The researchers (e.g., [2,4,35,42,69]) analyse the influence of the industrial production index on credit risk. Results reveal an insignificant effect between this index and the banking credit risk represented by non-performing financing [34].

(d) Industry-value-to-GDP, according to Koju, Koju, and Wang [17], reflects industrial development and, due to the appropriate industrial policy, the economic activities increase while the payment capacity improves. In this way, the purchasing power of the citizens is seen as a significant macroeconomic indicator and could be used as an important predictor of the NPLs ratio.

(e) Construction activity index could be representative of the secondary sector of the economy; therefore, we suggest using this index in the banking credit risk research. Based on the research results [2], the quality of loans in the banking system is not affected by the construction activity index.

(f) Business freedom describes governance practices connected to business freedom. After an empirical analysis, Maltritz and Molchanov [10] reveal that the effect of business freedom on the country's default risk is mixed; i.e., this effect is positive but statistically insignificant in developed countries; in contrast, it is negative but statistically insignificant in emerging economies.

Mixed findings of studies for different variables were observed. Therefore, the business sector variables are expected to have an insignificant relationship with the NPLs. Based on these arguments, Hypothesis 9 is formulated:

Hypothesis 9 (H9): *Business sector variables are insignificantly related to the NPLs.*

3.2.10. Financial Sector Variables

In the previous research, the financial sector is described by different variables. Thus, it is expedient to analyse these factors in more detail and then group them. Their grouping is based on the provision that examining interest rates and credit volume is appropriate. Therefore, regarding this sector, we consider it to be worth distinguishing the following sub-groups (i.e., the L5 groups of the FIBCR): (1) interest rates and (2) credit volume.

Interest rate as a determinant of credit risk is distinguished as follows: (i) some researchers [1,16] identify this indicator in the theoretical research; (ii) another part of researchers [2–4,12,20,30,34,41,42] analyse this indicator in the theoretical background for empirical research, (iii) while others use it in empirical research (e.g., [3,34,42]).

Studies can provide a detailed presentation, i.e., indicate the direction of the relationship. Some examples are given below. (1) Researchers document a positive impact of the interest rate on the credit risk; i.e., the credit risk rises when the interest rate increases [3,8,12,44]: the increase in the interest rate causes the rise in debt burden [1,15,29,40] and the NPLs increase. (2) Findings of studies demonstrate a negative impact of the interest rate on credit risk (e.g., [42]). Additionally, researchers document a significant negative impact with a time lag (e.g., [57]). (3) Researchers determine an insignificant impact of interest rate on credit risk (e.g., [8,31]). (4) Researchers report mixed effects that depend on determinants included in the models. For example, for Chinese banks (2005–2014), the significant negative relationship between the effective interest rate and the NPLs ratio is reported by a model with macroeconomic determinants for the listed and unlisted banks, i.e., for the whole sample [41]. For the model with macroeconomic and bank-specific determinants, the result is significant-positive.

In scientific papers, researchers present different interest rate modifications used as macroeconomic variables. After analysing the literature, the following variables can be distinguished:

(1)   the overnight interest rate. For example, Harada and Kageyama [41] use this variable to investigate the macro aspects of bankruptcies in Japan over the period of 1975–2005.

(2)   short-term interest rate. For instance, when investigating the country's credit risk, Maltritz and Molchanov [10] use the one-year US interest rate to describe the short-term US interest rate. By analysing credit risk determinants in the Romanian and Bulgarian banking systems, Karoglou, Mouratidis, and Vogiazas [43] approximate the monetary policy shock by the changes in the short-term interest rate.

(3)   long-term interest rate. For example, it is used to assess firms' default probability in the Eurozone (over the period of 2007–2017). Carvalho, Curto, and Primor [42] use the 10-year treasury bond yield as a macroeconomic determinant. The long-term interest rate is used by Castro [3] to analyse the banking credit risk in the GIPSI (Greece, Ireland, Portugal, Spain, and Italy) countries (1997–2011).

(4)   the real interest rate. For instance, it is employed to detect the determinants of the NPLs for a sample of 85 banks in Italy, Greece, and Spain (2004–2008); Messai and Jouini [45] include this interest rate in their study. To examine determinants of the NPLs for all commercial banks and savings institutions in the US states (1984–2013), Ghosh [31] employs this interest rate as well. The long-term interest rate and real interest rate are used by Castro [3] to analyse the banking credit risk in the GIPSI countries (1997–2011).

(5)   several variables or other variables are used. For example, Umar and Sun [41] use the "effective interest rate". Carvalho, Curto, and Primor [42] use the "interest rate on loans to non-financial companies (annual average)". Castro [3] employs the "long-

term interest rate", the "real interest rate" and the "spread between the long and short-term interest rate". Gila-Gourgoura and Nikolaidou [2] include three interest rates, i.e., "interest rate on loans granted to households", "interest rate on loans granted to non-financial companies", and "interest rate on deposits". Aver [70] uses thirteen interest rates, five of which are statistically significant.

(6) the variable is not detailed and is defined as an "interest rate". This approach is widely preferred in theoretical studies (e.g., [1–4,12,20,31,35,43]).

According to Beck et al. [21], lending interest rates are standard empirical determinants of bank asset quality. Thus, in scientific works, it is consistent to see a group of scientists that specifies the "interest rate" variable and uses the "lending interest rate".

The findings of the studies on the relationship between lending rates and credit risk have been mixed. (1) Researchers document a positive impact of interest rate on credit risk [11,18,21,32], whereas "in the case of lending interest rates, the channel to non-performing loans is likely to work through a rise of debt service costs of borrowers with variable rate contracts" [21]. (2) On the other hand, the findings of studies document an insignificant impact of the interest rate on credit risk [11,37], whereas "short-term policy rates set by central banks are not fully transmitted to lending interest rates" [21].

Considering the aforementioned information, it is worth distinguishing the following variables in the "interest rates" variable group: (a) overnight interest rate, (b) lending rates, and (c) interest rate on loans to non-financial companies.

Excessive credit growth could be a significant leading indicator of future problems in the financial sector [57], especially in periods of excessive optimism, when financial institutions could grant loans to riskier clients [57]; i.e., the potential NPLs are formed in an expansionary phase of the economic cycle. On the other hand, "excessive credit growth also stimulates aggregate demand", and "can cause overheating of economy".

Credit growth is used as a macroeconomic conditions factor both (i) in the theoretical background for empirical analysis (e.g., [2,20,31,36,42]) and (ii) in empirical research (e.g., [3,43]).

When assessing the impact of credit growth on NPLs, it is necessary to assess "from which side of market (either demand or supply) the rising credit growth comes" [57]. On the one hand, if the credit growth is from the supply side; i.e., loan growth is driven by the willingness of banks to lend, "lending increases either through the reduction in lending rates or lowering credit requirements for new loans". This would negatively affect the quality of bank loans; hence, credit growth has a positive impact on the NPLs. On the other hand, if the credit growth is from the demand side, the willingness of borrowers to borrow "will drive loan rates upwards and lead to tightening of credit standards", as well as it will reduce the probability of future loan defaults. Hence, a positive relationship between credit growth and asset quality is assumed; therefore, credit growth has a negative impact on the NPLs.

Empirical studies demonstrate the relationship between credit growth and NPLs. However, the findings of studies have been mixed. (1) Researchers document an insignificant impact of credit growth on credit risk [37]. (2) Researchers (e.g., [3,15,21,43,60,71]) document a positive impact of credit growth on the credit risk, specifically on the NPLs., whereas "the more credit expands, the higher the likelihood that the defaults will increase in the future" [20]. (3) Researchers (e.g., [11,72]) document a negative impact of credit growth on the credit risk. This result is explained as follows. Firstly, "the loans borrowed were put into productive activities and in hence earning a return which in turn repays the loans" [11]. On the other hand, banks develop a more active approach to screen loan applicants. (4) Researchers document the impact of credit growth on credit risk with a time lag, e.g., lagged effect is identified by Sulganova [57] and the findings of the study are mixed.

In scientific papers, researchers present different modifications of "credit growth" used as macroeconomic variables. (i) Most authors [3,21,36,37,43,60] use the variable "credit growth". Sometimes, certain modifications are used, e.g., "cumulative credit growth" [73],

"logarithm of total loans" [55], or "domestic credit growth to the private sector by commercial banks" [11]. (ii) Other researchers select the variable "credit growth rate" [67], "loan growth rate" [14], "the growth rate of the private-credit-to-GDP" ratio [37] or "domestic credit to the private sector by banks-to-GDP" [20]. (iii) To identify the "initial macroeconomic and financial market conditions that help explain the distinct response of the real economy of a particular country to the recent global financial crisis", Feldkircher [36] analyses pre-crisis credit growth as a factor in crisis severity.

Considering the abovementioned information, it is worth distinguishing the following variables in the "credit growth" variable group: (a) credit growth, (b) domestic credit to the private sector, (c) domestic credit to the private-sector-to-GDP, and (d) pre-crisis loan growth.

To summarise, despite the mixed findings of studies on different variables, many studies reveal the positive impact of financial sector variables on credit risk. Therefore, the financial sector variables are expected to have a positive relationship with the NPLs. Based on these arguments, Hypothesis 10 is formulated:

Hypothesis 10 (H10): *Financial sector variables are significantly positively related to the NPLs.*

3.2.11. General Government Sector Variables

In the previous research, the general government sector is described by employing different variables, e.g., public debt, public-debt-to-GDP, public indebtedness, etc. A deeper analysis revealed that though the factors have different names, their meaning is the same. Thus, it is expedient to analyse these factors in more detail and then group them. Their grouping was based on the provision that it is appropriate to examine public sector finances when analysing public debt and budget. Therefore, regarding this sector, we consider it is worth distinguishing the following sub-groups (i.e., the L5 groups of the FIBCR): (1) public debt, (2) budget, and (3) other.

In previous studies, the public debt was characterised by the following variables: public debt; public-debt-to-GDP, public indebtedness, and debt service payments-to-exports ratio. Further, they will be discussed in greater detail.

(a) Public debt [2,3,17,30,31,44,74]. It should be noted that studies show mixed results. For example, (i) based on the research results [2], in the Italian banking system, the quality of loans is not affected by public debt. (ii) Study by Foglia [74] indicates that the public debt (measured by the gross public debt) has a significant negative impact on the NPLs. This result is unexpected and explained by the author as indicated: "analysis was conducted during the period from 2008 to 2020, i.e., during the recent financial crises that hit the Italian financial system".

In addition, it is worth noting that researchers sometimes state that they are analysing the public debt but the public-debt-to-GDP ratio is used to measure this variable. For example, (i) Ghosh's [30] findings show that public debt (measured by the public-debt-to-GDP ratio) significantly increase the NPLs. Additionally, the researcher concludes that "a reduction in the US federal government's public debt will help lower NPLs". (ii) In the study by Makri et al. [44], the public debt is proxied by the public debt as a percentage of GDP [3]; i.e., the public debt-to-GDP ratio is used. Researchers find that public debt is significantly and positively related to NPLs. This relationship, as Makri et al. [44] state, shows that "the fiscal problems in Eurozone countries might lead to an important rise of problem loans". (iii) Bayar [60] investigates the banking sector in emerging economies over the 2000–2013 period and reveals that the public debt (measured by the general government gross-debt-to-GDP ratio) affects the NPLs significantly positively.

(b) Public-debt-to-GDP. A variable defined as the public-debt-to-GDP is used by researchers (e.g., [4,29]). For example, Dimitrios, Helen, and Mike [31] empirical study reveal that the effect of the public-debt-to-GDP on the NPLs is negative but statistically insignificant in the Euro-area banking system for the period of 1990–2015.

(c) Public indebtedness. A variable defined as public indebtedness is used by researchers (e.g., [3,20]). For example, Castro [3] concludes that the banking credit risk is significantly affected by credit growth: the credit risk increases when the credit growth increase; i.e., the impact is positive. In this context, as the author explains, the variable "credit growth" includes both private (i.e., business and individual) and public loans. If these loans are analysed separately, the empirical results are the following: (i) the increases in the private indebtedness measured by the total private-loans-to-GDP ratio have the same effect as credit growth; however, (ii) the level or even the changes in the public indebtedness proxied by the government public-debt-to-GDP ratio "have not proved to be relevant to the level of credit risk in the economies".

(d) Debt service-payments-to-exports. According to the theoretical analysis of Maltritz and Molchanov [10], the debt service ratio (ratio of the debt service payments-to-exports) has a significant but heterogeneous effect on the country default risk as shown by the conducted studies. In the empirical research, Maltritz and Molchanov [10] reveal that the effect of the debt service ratio on the country default risk is mixed. This is also confirmed by the authors' empirical study; i.e., this effect is positive but statistically insignificant in developed countries; in contrast, it is statistically and significantly negative in emerging economies.

As it can be seen from the presented research, definitions of variables are not well established. Even three variables, i.e., public debt, public-debt-to-GDP, and public indebtedness, can be proxied by the "public-debt-to-GDP" variable.

Regarding the beforementioned information, we consider it is worth distinguishing the following variables in the "public debt" variable group: (a) public debt, (b) public-debt-to-GDP, and (c) debt service payments-to-exports ratio.

In previous studies, the budget was characterised by the following variables: tax on personal income, tax on personal-income-to-GDP, and budget-balance-to-GDP ratio. Below, they will be discussed in more detail.

(a) Tax on personal income measured as a tax on personal-income-to-GDP ratio, as Dimitrios, Helen, and Mike [29] state, is a significant determinant of the NPLs. According to the authors, as a tax on personal income increases, disposable income and ability to repay loans decrease; i.e., the impact of tax on personal-income-to-GDP on the NPLs can be expected to be positive. This finding is also supported by the Dimitrios, Helen, and Mike [29] empirical study.

(b) Budget-balance-to-GDP describes governance practices related to fiscal practices and the tax burden. After an empirical analysis, Maltritz and Molchanov [10] reveal that the effect of the budget-balance-to-GDP on the country default risk is negative but statistically insignificant both in developed countries and in emerging economies. Dimitrios, Helen, and Mike [29] obtain similar results in the Euro-area banking system for the period of 1990–2015.

Considering the beforementioned information, in the "budget" variable group, it is worth distinguishing the following variables: (a) tax on personal-income-to-GDP and (b) budget-balance-to-GDP ratio.

In the "other" variable group, we consider it is worth distinguishing the fiscal freedom variable. This decision is made since fiscal freedom describes governance practices connected to fiscal practices and the tax burden. The significance of this indicator is also shown by the research. For example, after an empirical analysis, Maltritz and Molchanov [10] use this variable as a fiscal risk variable and reveal that the effect of fiscal freedom on the country's default risk is negative but statistically insignificant both in developed countries and in emerging economies.

To summarise, the findings of studies for different variables have been mixed. Therefore, the general government sector variables are expected to have an insignificant relationship with the NPLs. Based on these arguments, Hypothesis 11 is formulated:

Hypothesis 11 (H11): *General government sector variables are insignificantly related to the NPLs.*

3.2.12. Households Sector Variables

Various macro variables connected to the household sector and impacting the NPLs are analysed in scientific works. We suggest adding these variables into one group, i.e., the group of the household sector FIBCR (see Figure A1). The factors of this group will be discussed in greater detail.

(a)   Personal Income. After combining various economic and financial variables and establishing three explanatory factors, i.e., the real economy, inflation, and housing, Liao and Chang [22] conclude that the real economic factor has a significant negative effect on the default risk, while the personal income, a variable that is part of the real economic factor, is significantly positive.

(b)   Personal income growth. For example, Liao and Chang [22] distinguish this indicator in the theoretical background for empirical analysis. The authors claim that studies (e.g., Duffie et al. [75]) propose that corporate default and bankruptcy can be better understood by using macroeconomic indicators, one of which is personal income growth.

(c)   Real personal income growth rate is also distinguished in the theoretical background for empirical analysis (e.g., [30,31,41,60]). With regard to regional economic factors, in empirical research, Ghosh [30] finds that a higher real personal income growth rate reduces the NPLs; i.e., this variable has a negative impact on the NPLs.

(d)   Some researchers do not use personal income but only part of the income, i.e., wages and salaries. More precisely, Kjosevski, Petkovski, and Naumovska [51] reveal that the net increase in salaries has a negative impact on the growth of NPLs. In this research, it is suggested to use wages and salaries per employee, as it seems to be a more informative indicator.

(e)   Final consumption expenditure of households per capita [4]. This indicator is not widely used. It might be because of its calculation since, as the World Bank states, "many of the estimates are based on household surveys, which tend to be one-year studies with limited coverage".

(f)   Tax on personal income and the tax on personal-income-to-GDP. Tax on personal income is distinguished in the theoretical background for empirical analysis by Gila-Gourgoura and Nikolaidou [2]. However, they do not use it in their empirical research. This factor (measured by the tax on personal-income-to-GDP ratio) is empirically tested by Dimitrios, Helen, and Mike [29]. The researchers highlight the importance of their study as it is the first empirical study to examine the role of a tax on personal income. Dimitrios, Helen, and Mike [29] reveal that the tax on personal-income-to-GDP has a significant and positive influence on the NPLs; i.e., as the tax on personal income increases, disposable income and the ability to repay loans decrease.

(g)   As stated in Section 3.2.9, after the analysis of the macroeconomic determinants of banking sector distresses, Pesola [68] reveals that high customer indebtedness contributed to the distress in the banking sector. However, in Pesola's [68] study, the private „indebtedness indicator covers both the corporate and household sectors". Castro [3] describes "private indebtedness" in a similar manner. Moreover, this researcher finds that private indebtedness has a significantly positive impact on NPLs. On the other hand, if we want to show the separate impact of the business sector and household sector, the indebtedness indicator has to be decomposed into two components: business indebtedness and household indebtedness, which we suggest measuring by the household-loans-to-GDP ratio. It is expected that the impact of household indebtedness on the NPLs is positive. As in the case of business indebtedness, this assumption is based on the following explanation: high indebtedness makes borrowers "more vulnerable to adverse shocks affecting their wealth or income, which raises the chances that they would run into debt servicing problems" [3,15].

(h)   Interest debt burden is important to loan default [2,15,41,67]. For example, Blanco and Gimeno [67] explain the dynamic behaviour of default ratios in Spain for household

sector loans; i.e., the increase in the interest debt burden affects the default ratios significantly and positively.

Considering that previous studies show mixed results for the different household sector variables, we conclude that, in this study, these variables are expected to have an insignificant relationship with the NPLs. Based on these arguments, Hypothesis 12 is formulated:

Hypothesis 12 (H12): *Household sector variables are insignificantly related to the NPLs.*

4. Data and Methodology

4.1. Data Selection

Seeking to achieve the main goal of this research, i.e., to identify the macroeconomic determinants of consumer loan credit risk and to assess the impact of these determinants quantitatively, the group of Central and Eastern European (CEE) countries, as they are defined by OECD (2000)—i.e., Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, the Slovak Republic, Slovenia, Estonia, Latvia and Lithuania—is selected for further research. According to OECD (2000) classification, Albania is also included in the CEE countries group; however, taking into account the fact that Albania is not a member of the European Union and the resulting problems of data availability and uniformity, it was decided not to include this country in further research. The entire group of countries is analysed using the panel data approach (annual data). For a more detailed view, one of the countries, Lithuania, is analysed separately, using simple ordinary least squares regression, least squares with breakpoints regression and the Markov Regime Switching model approach (quarterly data). The choice of the case of Lithuania for more detailed analysis is limited by the availability of higher frequency data (in the case of the rest of the countries, only annual NPLs data are available).

In this research, the longest possible data series (in terms of non-performing loans data) including the most recent available data was used, which is: (i) year 2008–2020 for panel estimation of the group of CEE countries (11 countries * 13 years—143 panel observations), and (ii) 2005 1st quarter–2021 1st quarter for the detailed analysis of the case of Lithuania (65 observations) (in both cases the data of non-performing loans for consumption is limited to these periods).

Regarding the independent variables, it should be noted that after the analysis of scientific literature, sixty-five potential determinants of consumer loan credit risk (from previously discussed groups at different levels) were selected. Taking into account that it is necessary to investigate the factors influencing credit risk and, in particular, to classify these factors at different levels. In this analysis, we do not limit our analysis to banking credit risk alone but also use both country and enterprise credit risk studies. After assessing data availability, 44 independent variables were first selected for further research. These variables, their symbols, measurement units and data sources are provided in Table A2. The data provided by Eurostat, ECB, OECD, Worldbank, and other institutions, are used. The data collected are organised and analysed using Eviews and SPSS software packages.

As a starting point, the stationarity of the variables in Table A2 is checked using the unit root tests: (i), the Levin, Lin and Chu t* test for panel data of the group of CEE countries, and (ii) the Augmented-Dickey–Fuller test for the data of Lithuania. The results of the unit root tests are provided in Table A3 (since non-stationary variables are excluded from further research, only stationary variables are presented in Table A3). The stationarity at first and/or at second difference has been evaluated when necessary.

As the results in Table A3 reveal, for the group of CEE countries 39 out of 44 variables appeared to be stationary, and for Lithuania 33 out of 45 variables appeared to be stationary. These variables are used for further research (variables are differenced, when necessary, see Table A3). The descriptive statistics of selected variables are provided in Tables A4 and A5. Further, the research methods used are discussed.

4.2. Model Specification

Pursuing the main purpose of this research, a study consisting of several steps is conducted. Here, these steps are discussed in detail.

Step 1. Assessment of the impact of selected macroeconomic variables on consumer loan credit risk in the group of CEE countries. Taking into account the narrowness of the data sets (13 observations for each country), it can be stated that the traditional regression technique applied for each CEE country separately would not deliver reliable results. However, panel data models are quite suitable for checking whether the variations of macroeconomic variables affect changes in consumer loan credit risk and quantitatively express this impact. When assessing the determinants of credit risk, the panel approach was used by De Bock and Demyanets [37], Beck, Jakubik and Piloiu [21], Espinoza and Prasad [8], Nkusu [15], Castro [3], Mpofu and Nikolaidou [20] and others. In this research, both fixed and dynamic effects are taken into consideration, and the bivariate simple OLS panel data models with constant, fixed and random effects are formed and evaluated. At first, the models with constant are constructed (Equation (1)).

$$Y_{it} = \alpha + \beta X_{it} + u_{it} \tag{1}$$

where:
$i = 1, 2, \ldots, N$ and $t = 1, 2, \ldots, T$;
N = number of cross-sections (countries);
T = number of periods (years);
Y_{it}—dependent variable;
α—intercept;
β—coefficient;
X_{it}—independent variable;
u_{it}—error term.

After that the models are checked for fixed and random effects: fixed effects and random effects models are constructed (Equations (2) and (3) and statistical tests (F test and Hausman test) are used to identify the most appropriate models.

$$Y_{it} = \alpha_i + \beta X_{it} + u_{it} \tag{2}$$

where:
α_i—intercept.

$$Y_{it} = \alpha_i + \beta X_{it} + (ui_i + v_i) \tag{3}$$

where:
$ui_i + v_i$—error term.

The selected models allow us to make conclusions regarding the relationship between selected macroeconomic variables and consumer loan credit risk.

Step 2. Assessment of the impact of selected macroeconomic variables on consumer loan credit risk in Lithuania. Since in the case of Lithuania, not only annual but also quarterly data, as well as a longer data series, are available, the possibilities of applying the different research methods for the assessment of the relationship between selected macroeconomic variables and consumer loan credit risk are wider. Thus this relationship is evaluated using three different methods:

(i) *Simple OLS regression.* As a starting point, similarly to Washington [11], Haniifah [38] and others who have used the simple OLS regression technique to identify the determinants of credit risk, the impact of selected macroeconomic variables on consumer loan credit risk is assessed using bivariate simple OLS regression models, which are constructed for each pair of dependent and independent variables in Table A2.

(ii) *Least squares with breakpoints regression.* When assessing the relationship between selected macroeconomic variables and consumer loan credit risk, the existence of the structural breaks is also taken into account in this research. Thus, linear bivariate

regression is also conducted using least squares with breakpoints method. Structural breaks are estimated according to the Bai-Perron procedure.

(iii) *Markov regime–switching model*. Finally, it is also taken into account that the period selected for this research includes both relatively stable and crisis periods. As it is stated by Danielsson [76] and Haldane [77], the statistical properties of data during stable periods differ from those during stable periods. Thus, following Davig and Leeper [78] and Karoglou, Mouratidis and Vogiazas [43], endogenous breaks are assumed and coefficients of the models are allowed to change across different regimes. A Markov regime-switching model (MRS SVAR) is employed since it "allows for the data generating a process to exhibit completely different dynamics across a predefined number of regimes" [43]. The existence of two different regimes is predetermined in this research.

In addition, the decision to apply the above-mentioned methods that adhere to the main aim of this research is based on the following reasons: (i) in the case of the CEE group countries, the choice of method was based on a rather limited data series (panel data models combine time series and cross-sectional data), in this way allowing the researchers to reach a sufficient number of observations; (ii) in the case of Lithuania: (a) simple OLS regression model was chosen as the primary model allowing to make assumptions about the existence of a statistically significant relationship in the overall assessment of the entire analysed period; (b) a long enough research period, covering both periods of economic boom and crisis, implies the possibility of the existence of structural breaks, i.e., sudden changes in a relationship between chosen variables or in a time series, and the model with breakpoints was therefore applied to take into account those changes; (c) given the cyclicality observed in some macroeconomic variables, the Markov regime-switching model has been chosen to assess the relationship across different recurent phases, i.e., regimes.

Further the results of the research are discussed.

5. Results

In this part, the results of the research are discussed. The results of the assessment of the impact of selected macroeconomic variables on consumer loan credit risk in the group of CEE countries are provided in Table A6. From these results, it can be observed that 12 out of 39 selected macroeconomic variables appeared to have a statistically significant impact on consumer loan credit risk. Further the results are discussed separately for each of the 12 groups of macroeconomic variables.

The results of the assessment of the impact of selected macroeconomic variables on consumer loan credit risk in the case of Lithuania are provided in Tables A7–A9. From these results, it can be noticed that:

(i) according to simple OLS regression models, 9 out of 33 selected macroeconomic variables appeared to have a statistically significant impact on consumer loan credit risk;

(ii) according to Least Squares with Breakpoints regression models, 18 out of 33 selected macroeconomic variables appeared to have a statistically significant impact on consumer loan credit risk in at least one of the selected periods;

(iii) according to Markov Regime Switching models, 15 out of 33 selected macroeconomic variables appeared to have a statistically significant impact on consumer loan credit risk under one of two different regimes.

Further the results are discussed separately for each of the 12 groups of macroeconomic variables.

5.1. GDP Variables

GDP variables are very important indicators in the risk measuring process, especially in credit risk assessment. Many authors have focused on GDP variables trying to identify the impact on credit risk but have got quite different results. In our research, we not only use real GDP growth, but also focus on other GDP variables.

CEE countries. As can be seen from Table A6, two of the analysed GDP factors (GDP growth and real GDP growth) appeared to have a statistically significant positive impact on credit risk in the group of CEE countries, while others have not demonstrated a statistically significant effect. In practice, banks tend to take more credit risk when the economy is growing, which definitely increases credit risk in the long run. In a growing economic environment, banks are more positive, and risk-takers and the household is more focused on consumption and risk-taking, not thinking much about future income possibilities. From a practical point of view, we can stress that GDP growth can affect credit risk differently in different time horizons. Still, it is challenging to determine because of data frequency.

Our results differ from the results by Mpofu and Nikolaidou [20], Espinoza and Prasad [8], Nkusu [15], De Bock and Demyanets [37], and Beck, Jakubik, and Piloiu [21] which revealed a significant negative relationship between real GDP growth and NPLs, as well as from the results by Castro [3] which states that increasing GDP growth decreases the credit risk. The results for the group of CEE countries also differ from the results of Dimitrios, Helen, and Mike [29], Gila-Gourgoura and Nikolaidou [2], Carvalho, Curto, and Primor [42] (as cited by Bruneau et al. [79]), Dimitrios, Helen, and Mike [29], Koju, Koju, and Wang [17], stating the existence of a significant relationship between NPL and such variables as GDP gap (output gap), gross national income (GNI) per capita growth or gross national expenditure (GNE). Thus, in the case of CEE countries, Hypothesis 1 (H1) cannot be supported.

Lithuania. In the case of Lithuania, the results are a bit different: (i) simple OLS regression models showed a statistically significant negative relationship between consumer credit risk and real GDP, GDP growth, real GDP growth and gross national income (Table A7); (ii) least squares with breakpoints regression models revealed a statistically significant negative relationship between consumer credit risk and real GDP, GDP growth, real GDP growth and gross national income during the period of 2005Q2–2011Q2 (Table A8); and (iii) Markov regime-switching models indicated a statistically significant negative relationship between consumer credit risk and real GDP, real GDP growth and gross national income under Regime 1 (Table A9). These results coincide with the results by (i) Priyadi et al. [35] stating negative GDP on NPF; (ii) Nikolaidou and Vogiazas [31] stating a negative relationship between GDP growth and credit risk; (iii) Espinoza and Prasad [8], Nkusu [15], De Bock and Demyanets [37], and Beck, Jakubik, and Piloiu [21] revealing a significant negative relationship between real GDP growth and NPL; (iv) Koju, Koju, and Wang [17] indicating a significant negative impact of GNI per capita growth rate on the NPLs. So, in the case of Lithuania, Hypothesis 1 (H1) is supported by the results of this research.

Moreover, it can be mentioned that results also revealed: (i) no significant relationships between loans for consumption and GDP variables in the group of CEE countries (Table A10); and (ii) a significant positive relationship between loans for consumption and gross national income (confirmed by all three methods) (Tables A11–A13). These results are summarized in Table A14. Despite statistical results, we must keep in mind that in practice, it is very important to pay attention to the time frame.

5.2. Inflation Variables

CEE countries. As it can be seen from Table A6, three out of four inflation variables appeared to be statistically significantly related to the credit risk variable, and the impact of these variables (consumer price index (CPI), percentage change in CPI, and GDP deflator) is negative (i.e., risk decreasing). It is necessary to admit that this conclusion is correct only when assessing the rate of inflation itself: (i) this effect is observed since we have had very low inflation in the euro area for a long time—in the recent situation then the observed increase in inflation was still below 2%, credit risk is declining; (ii) however, this conclusion cannot be generalized, cause when inflation is at historic highs, the effect will be just contrary. These results are consistent with the results of Washington [11], Koju, Koju, and Wang [50], and Kjosevski, Petkovski, and Naumovska [51] which revealed

a significant negative relationship between inflation and NPL. Additionally, the results are similar to those stating that the GDP deflator has a significant impact on NPL (for example, Harada and Kageyama [40] (as cited by Carvalho, Curto, and Primor [42] and Liao and Chang [22]) who stated that GDP deflator "negatively impacts default". However, these results differ from the results of Ghosh [30] and Mpofu and Nikolaidou [20] which state that this relationship is significantly positive. Thus, in the case of CEE countries, Hypothesis 2 (H2) is supported.

Lithuania. The results for Lithuania have not revealed a statistically significant impact of inflation variables on consumer credit risk (i.e., impact appeared to be both positive and negative, but statistically insignificant) (Tables A7–A9). These results are similar to the results of Haniifah (2015), [17], Radivojević et al. [80], Abusharbeh [12], Nor, Ismail, and Abd Rahman [53]. Thus, in the case of Lithuania, Hypothesis 2 (H2) is supported as well.

The research also indicates that: (i) there is no statistically significant relationship between loans for consumption and inflation variables in the group of CEE countries (Table A10); (ii) simple OLS model showed the significant positive impact of producer price index on loans for consumption (Table A11). These results are summarized in Table A14.

5.3. Money Variables

As it can be seen from the results in Tables A6–A9, none of the money variables has demonstrated a statistically significant impact on consumer credit risk (in most cases, the impact is negative but statistically insignificant) both for the group of CEE countries and for Lithuania. This result differs from the results obtained by Karoglou, Mouratidis, and Vogiazas [43], Nikolaidou and Vogiazas' [56] which identified a statistically significant impact of money supply on credit risk, as well as from results obtained by Yurdakul [46] indicating a positive but statistically insignificant impact. The results of this research also contradict the results obtained by Maltritz and Molchanov [10] and Stolbov [48] concluding that increasing international reserves reduces the risk. Thus Hypothesis 3 (H3) cannot be supported both for the group of CEE countries and Lithuania.

The research also indicates that: (i) there is no statistically significant relationship between money variables and loans for consumption variables in the group of CEE countries (Table A10); (ii) one of three methods (least squares with breakpoints) revealed a positive impact of money supply and negative impact of international reserves, but only during period 2008Q4–2011Q4 (Table A12). These results are summarized in Table A14.

5.4. Investment Variables

CEE countries. According to the results (Table A6), none of the investment variables has demonstrated a statistically significant impact on consumer credit risk in the group of CEE countries (impact is negative but statistically insignificant). This result is similar to that obtained by Maltritz and Molchanov [10] who found that the effect of capital-investment-to-GDP on a country's credit risk is negative but statistically insignificant. Since the results do not provide evidence of statistically significant impact, Hypothesis 4 (H4) cannot be supported for the group of CEE countries.

Lithuania. The results are different in the case of Lithuania: (i) the least squares with breakpoints regression models revealed the statistically significant and negative impact of gross fixed capital formation and capital investment variables impact on consumer loan credit risk in the period of 2005Q2–2011Q2 (Table A8); (ii) while Markov regime-switching model revealed the mixed-nature impact of gross fixed capital formation under different regimes (Table A9). This allows us to partially support Hypothesis 4 (H4) in the case of Lithuania.

The research also indicates that: (i) all three methods indicate the existence of a statistically significant positive relationship between investment variables and loans for consumption in Lithuania (Tables A11–A13). These results are summarized in Table A14.

5.5. Labour Market Variables

CEE countries. As it can be noticed from Table A6, (i) the long-term unemployment rate demonstrates a statistically significant positive (risk-increasing) effect on consumer loan credit risk in the group of CEE countries, (ii) while the effect of the unemployment rate appeared to be statistically insignificant. These results differ from the results of (i) Kumar et al. [58], Zheng, Bhowmik, and Sarker [31], which confirm the negative impact of unemployment on credit risk; and (ii) Feng [61] who states that the impact is statistically insignificant. However, the results of this research support the results of Nkusu [17], Bayar [60], Szarowska (2014) (11 CEE countries), [62], Koju, Koju, and Wang [17], Kocisova and Pastyrikova [63], Castro [3], Messai and Jouini [45], Karoglou, Mouratidis, and Vogiazas [43], stating the positive impact of unemployment on credit risk. Thus, in the case of the group of CEE countries, Hypothesis 5 (H5) is supported.

Lithuania. In the case of Lithuania, the results are similar: (i) two of three methods revealed a statistically significant positive relationship between long-term unemployment and consumer loan credit risk; (ii) while all three methods have confirmed the same relationship between the unemployment rate and consumer loan credit risk (Tables A7–A9). These results are consistent with Yurdakul [46], Ghosh [30], Gila-Gourgoura and Nikolaidou [2], Kjosevski, Petkovski, and Naumovska [51]. Thus, in the case of Lithuania Hypothesis 5 (H5) is supported.

The research also indicates that: (i) a statistically significant negative relationship between the unemployment rate and loans for consumption in the group of CEE countries (Table A10); and (ii) mixed-nature effect of unemployment variables on loans for consumption in Lithuania (Tables A11–A13). These results are summarized in Table A14.

From a practical point of view, we should add some reflections on unemployment and credit risk volatility. When unemployment increases, people tend to take loans at the beginning of such an environment, especially for consumption. Banks still have no strict credit risk management rules at the beginning; central banks support economics and encourage the banking sector to support the economy by the credit transmission channel, which means that credit risk is increasing. Later, when the unemployment growth rate increases, the existing loan portfolio credit risk level also increases. However, banks tend not to take credit risk anymore and apply a strict credit risk management framework. Finally, we can make conclusions that, in any way, from a practical point of view, the increasing unemployment rate increases credit risk at a different pace in different time frames.

5.6. Real Estate Market Variables

CEE countries. As is seen in Table A6, the real estate market variable—housing price index—proved to have a statistically significant negative (risk-decreasing) effect on consumer loan credit risk in the group of CEE countries. These results are similar to those of (i) Liao and Chang [22] indicating a negative effect on default risk; and (ii) Castro [3] indicating a negative effect of housing prices on credit risk [3]. Thus, in the case of the group of CEE countries, Hypothesis 6 (H6) is supported.

Lithuania. Results for Lithuania are different: the impact of the housing prices index on consumer loan credit risk appeared to be statistically significantly positive at least in one of the periods (2011Q2–2021Q1) and at least under one of two regimes (Tables A8 and A9). This contradicts the results of Liao and Chang [22] and Castro [3]. Thus, in the case of CEE countries, Hypothesis 6 (H6) cannot be supported.

Additionally, it should be mentioned that in most cases the relationship between the housing price index and loans for consumption has proven to be statistically insignificant (Tables A10–A13). These results are summarized in Table A14.

5.7. Trade and Trade Composition Variables

CEE countries. Only one out of eight trade and trade composition variables—current account balance—was statistically significantly related to this risk in the case of the group of CEE countries (Table A6), while exports and imports variables, as well as trade balance

variable, appeared to have no statistically significant impact on consumer loan credit risk. These results differ from the results obtained by (i) Mileris [4], Gila-Gourgoura and Nikolaidou [2], and Koju, Koju, and Wang [17], who reveal that the current account variable has no statistically significant relationship with credit risk; and (ii) Koju, Koju, and Wang [17] who states that export is significantly negatively related to the NPL level. However, this is similar to Maltritz and Molchanov [10], according to whom the impact of exports and imports growth rates appeared to be negative but statistically insignificant. To sum up, in the case of CEE countries, Hypothesis 7 (H7) is supported by the results of this research.

Lithuania. In the case of Lithuania: (i) OLS regression models have not revealed a statistically significant impact of any of the trade and trade composition variables (Table A7); while (ii) contrary to the case of CEE countries, the Markov regime-switching method revealed the statistically significant positive impact of current account balance under one of two different regimes (Table A9); and (iii) least squares with breakpoints regression showed the statistically significant negative impact of exports per capita, exports growth rate and import-to-GDP variables (Table A8). To sum up, the results in the case of Lithuania appear to be mixed and this does not allow either support or reject Hypothesis 7 (H7).

Moreover, it can be mentioned, that results also revealed: (i) a significant positive relationship between loans for consumption and exports-to-GDP and trade balance variables in the group of CEE countries (Table A10); and (ii) in most cases, no significant relationship between loans for consumption and trade and trade composition variables in Lithuania (Tables A11–A13). These results are summarized in Table A14.

5.8. Consumption Variables

CEE countries. It can be seen (Table A6) that the consumer confidence index appeared to have a statistically significant negative effect on consumer credit risk—the increase in consumer confidence is related to the decrease in risk. This result is similar to (i) Figlewski, Frydman, and Liang [5] revealing the negative relationship between the change in consumer sentiment and corporate default; and (ii) Doshi, Jacobs, and Zurita [49] stating the negative relationship between consumer confidence index and countries default intensity. At the same time, the final consumption expenditure of households has not demonstrated a statistically significant effect in the case of the CEE countries. To sum up, in the case of CEE countries, Hypothesis 8 (H8) is at least partially supported by the results of this research.

Lithuania. Contrary to the results of the group of CEE countries, in the case of Lithuania: (i) final consumption expenditure of households has demonstrated a statistically significant negative effect on consumer loan credit risk at least in one period and under one regime (all three methods) which support the results of Mileris [4] stating that the increase in final consumption expenditure of households is related to the decrease in NPLs (ii) while consumer confidence index appeared to have no statistically significant effect (all three methods) (Tables A7–A9). To sum up, in the case of Lithuania, Hypothesis 8 (H8) is at least partially supported by the results of this research.

The research also indicates (in most of the models) an insignificant impact of consumption variables on loans for consumption in both CEE countries and Lithuania (Tables A10–A13). These results are summarized in Table A14.

5.9. Business Sector Variables

CEE countries. The results in Table A6 reveal that the industry-value-to-GDP variable has a statistically significant positive impact on consumer loan credit risk. This differs from the results of Koju, Koju, and Wang [17], stating the significant negative effect of industry-value-to-GDP on the NPLs.

Moreover, the results of the research also show that the industrial production index and business freedom variable appeared to have no statistically significant impact. These results are similar to the results obtained by: (i) Gila-Gourgoura and Nikolaidou [4] and Priyadi et al. [35] who indicated the insignificant effect of the industrial production index

on banking credit risk; and (ii) Maltritz and Molchanov [10] who stated that the relationship between business freedom and country default risk is insignificant. Since only one of three business sector variables has demonstrated a statistically significant impact on consumer loan credit risk, it can be stated that, in the case of the group of CEE countries, Hypothesis 9 (H9) is supported.

Lithuania. None of the business sector variables has demonstrated a statistically significant impact on consumer loan credit risk (all three methods) (Tables A7–A9). Thus, in the case of Lithuania, Hypothesis 9 (H9) is supported.

Moreover, it can be mentioned that the results also revealed: (i) a significant positive relationship between industrial production index and loans for consumption (Table A10) in the group of CEE countries. The results also show the mixed-nature effect on the industrial production index on loans for consumption in Lithuania (insignificant, significant positive, significant negative in different periods according to models using least squares with breakpoints) (Table A12). These results are summarized in Table A14.

5.10. Financial Sector Variables

CEE countries. The ratio of domestic credit to the private-sector-to-GDP showed statistically significantly positive, i.e., risk-increasing impact (Table A6). This result is consistent with Mpofu and Nikolaidou [20] who confirmed that domestic credit to private-sector-to-GDP significantly positively affects NPLs. At the same time, credit growth and domestic credit to private sector variables appeared to have no statistically significant impact on consumer loan credit risk (Table A6). This result differs from the results obtained by: (i) Nkusu [15], Castro [3], Beck, Jakubik, and Piloiu [21], Karoglou, Mouratidis and Vogiazas [43], Bayar [60], Tatarici, Kubinschi, and Barnea [71] that revealed a statistically significant positive relationship between credit growth and NPLs; and (ii) Washington [11] and Agic and Gacic [72] who documented the negative impact of credit growth on credit risk. Since at least one of the financial sector variables proved to have a positive effect on consumer loan credit risk, in the case of the group of CEE countries, Hypothesis 10 (H10) can be supported at least partially.

Lithuania. Slightly different results are received for Lithuania: (i) domestic credit to private-sector-to-GDP appeared to have no statistically significant effect on NPLs; (ii) while credit growth variable showed a statistically negative impact; and (iii) domestic credit to the private sector—mixed-nature (both positive and negative in different periods/under different regimes) (Tables A7–A9). According to that, it can be stated that in the case of Lithuania, Hypothesis 10 (H10) cannot be supported.

The research also indicates: (i) a statistically insignificant relationship between domestic credit to private-sector-to-GDP and loans for consumption in the group of CEE countries (Table A10); and (ii) mixed results for credit growth variable (Tables A10–A13). These results are summarized in Table A14.

5.11. General Government Sector Variables

CEE countries. As can be seen from Table A6, one out of four general government sector variables—budget-balance-to-GDP—demonstrated a statistically significant positive (risk-increasing) effect on consumer loan credit risk. This differs from the results of the research conducted by Maltritz and Molchanov [10], Dimitrios, Helen, and Mike [29] according to which the impact of the budget-balance-to-GDP variable on country default and banking system risks is insignificant.

However, the effect of public debt, public-debt-to-GDP and private-to-public indebtedness variables appeared to be statistically insignificant. These results differ from results obtained by: (i) Foglia [74], who indicated a negative significant impact of public debt; and (ii) Makri et al. [44], Ghosh [30] and Bayar [60] who found that the public-debt-to-GDP is significantly and positively related to the NPLs.

On the other hand, these results are similar to (i) Gila-Gourgoura and Nikolaidou [2] who stated that the quality of loans is not affected by the public debt; (ii) Dimitrios,

Helen, and Mike [29] who revealed the insignificant effect of public-debt-to-GDP on the NPLs; and (iii) Castro [3] who indicated that public indebtedness does not affect the credit risk significantly. Since three out of four general government sector variables have demonstrated no significant effect on consumer loan credit quality, it can be stated that Hypothesis 11 (H11) can be supported in the case of the group of CEE countries.

Lithuania. In the case of Lithuania: (i) public debt to GDP demonstrated a statistically insignificant relationship with consumer loan credit risk; and, contrary to the case of CEE countries, (ii) the significant negative relationship between public debt and NPLs can be observed; (iii) while the effect of budget-balance-to-GDP and private to public indebtedness variables appeared to be of mixed nature (Tables A7–A9). Thus, in the case of Lithuania Hypothesis 11 (H11) cannot be supported.

In addition to that, it is worth mentioning that: (i) there is a significant negative relationship between public-debt-to-GDP and loans for consumption in Lithuania (Tables A11–A13); and (ii) a significant positive relation of budget-balance-to-GDP and public-to-private indebtedness with loans for consumption in Lithuania (Tables A11–A13). These results are summarized in Table A14.

5.12. Household Sector Variables

The results provided in Tables A6–A9 reveal that tax on personal-income-to-GDP has no statistically significant impact either in the group of CEE countries or in Lithuania. These results differ from Dimitrios, Helen, and Mike [29] who indicated a significant and positive influence of tax on personal-income-to-GDP on the NPLs. On the other hand, the wages and salaries per capita variable has a statistically significant negative (risk-decreasing) effect on consumer loan credit risk both in the group of CEE countries and Lithuania which is consistent with the results of Kjosevski, Petkovski, and Naumovska [51] stating that increase in wages and salaries decreased the growth of NPLs. Thus, the results do not allow either support or reject Hypothesis 12 (H12) both for the CEE countries and Lithuania.

Moreover, it can also be stated that tax on personal-income-to-GDP has no statistically significant impact on loans for consumption in CEE countries and Lithuania (Tables A10–A13). These results are summarized in Table A14.

The results of all estimations of macroeconomic determinants of consumer loan credit risk in the group of CEE countries and Lithuania are summarised in Table A15.

Taking into account what was discussed, it can be summarized that in the case of the group of CEE countries: (i) such variables as GDP and labour market variables appeared to have a risk-increasing effect (i.e., positively affect the consumer loan credit risk); (ii) while variables such as inflation and real estate market variables proved to have a risk decreasing effect (i.e., negatively affect (decrease) consumer loan credit risk); at the same time (iii) the impact of variables from other groups appeared to be of a mixed nature or insignificant (Table A6). In the case of Lithuania: (i) real estate and labour market variables appeared to have a risk-increasing effect (i.e., positively affect the consumer loan credit risk); (ii) GDP and household sector variables proved to have a risk-decreasing effect (i.e., negatively affect (decrease) consumer loan credit risk); at the same time (iii) the impact of variables from other groups appeared to be of a mixed nature or insignificant (Tables A7–A9).

The results summarized in Table A15 also allow stating that the impact of macroeconomic determinants on the consumer loan credit risk differs depending on the country (countries group) analysed. Moreover, in the case of Lithuania, different methods demonstrate at least partially different results. At first glance, these results may appear to be hardly consistent; however, the differences are determined by the characteristics of applied methods. The simple OLS regression models evaluate the impact of macroeconomic determinants on consumer loan credit risk in the overall assessment of the entire analysed period but do not take into account the possible changes in nature of this impact. When the analysed period is long enough and covers periods different macroeconomic circumstances (for example, periods of economic boom and crisis), the results may not fully reflect the relationships under consideration. On the other hand, the models with breakpoints and

the Markov regime-switching models take into account those changes and assess the relationship across different circumstances or regimes; in this case, the results show that the impact changes as the macroeconomic situation changes: under certain circumstances, it is positive, under other circumstances it is negative or vice versa.

To summarise, it could be stated that the novelty of this research is related to the proposed deeper classification of credit risk factors. Moreover, it is also worth mentioning that, in the case of Lithuania, this kind of study (assessment of macroeconomic determinants of consumer loan credit risk) was conducted for the first time.

6. Discussion and Implications

In order to investigate the factors influencing credit risk, it is necessary to classify these factors at different levels. An analysis of the classifications of factors influencing credit risk in theoretical studies and empirical research has concluded that there is no single approach. Different trends can be identified, and a new classification is being developed on the basis of these trends. In this study, the classifications of factors influencing banking credit risk and the classification of macroeconomic factors influencing banking credit risk were developed using a systematic approach.

These factors are classified at five different levels. At the first level, credit risk is distinguished into two components: systematic credit risk and unsystematic credit risk.

At the second level, groups of factors which characterise the factors influencing the systematic and unsystematic credit risk are distinguished. At the second level, macroeconomic factors are often classified only as the factors influencing the systematic credit risk; therefore, we take a deeper approach and divide factors influencing the systematic credit risk into three groups: (i) macroeconomic factors, (ii) changes in economic policies factors, and (iii) and political changes factors.

At the fourth level, we take a deeper approach and general macroeconomic conditions factors are separated into twelve groups of the FIBCR; i.e., at this level, factors of (i) four different sectors are distinguished, i.e., factors of the business sector, financial sector, general government sector, and household sector, and (ii) eight groups of factors affected all sectors, i.e., economic growth, inflation, money, investment, labour market, real estate market, trade and trade composition, consumption. In addition, the four groups at this level are further detailed at the fifth level.

This classification can be useful to better understand and investigate the factors influencing banking credit risk for the whole loan portfolio (in the same way as the factors that affect the credit risk of different types of loans, e.g., consumer loans).

The research results revealed the statistically significant effect of specific macroeconomic consumer loan credit risk determinants from different groups at different levels. In the case of CEE countries, economic growth variables (GDP growth, real GDP growth) and labour market variables (long-term unemployment rate) appeared to have a positive (risk-increasing) impact. On the other hand, inflation variables (GDP deflator, consumer price index, percentage change in CPI) and real estate market variables (house price index)—a negative (risk decreasing) impact on consumer loan credit risk.

Among other things, the research results also allow us to make certain assumptions about the appropriateness of the methods applied. In the case of CEE countries, the panel models with dynamic effects proved to be the most appropriate when determining the relationship between the macroeconomic variables and consumer loan credit risk. This indicates the existence of some differences between the countries analysed (the countries are not homogeneous in terms of our study), which raises the need to analyse the situation in each country separately.

In the case of Lithuania, the highest expectations could be related to the structural breaks and Markov regime-switching models as these models allowed taking into account possible changes in the relationship between variables over a long period of time including both relatively stable and crisis periods. It can therefore be argued that recent methods

provide more information about the macroeconomic determinants of consumer loan credit risk and the nature of their impact.

The analysis of the case of Lithuania revealed the following results: (i) real estate (house price index) and labour markets (unemployment rate, long-term unemployment rate) variables appeared to have positive (risk-increasing effect), (ii) while GDP (real GDP, GDP growth, real GDP growth, gross national income) and household sector (wages and salaries) variables proved to have negative (risk-decreasing) effect.

The contribution of this study is related to the proposed deeper classification of credit risk factors. This classification reveals that the Tertiary and quaternary sectors (business sector) groups lack the quantifying determinants.

It is worth mentioning that, in the case of Lithuania, this kind of study (assessment of macroeconomic determinants of consumer loan credit risk) was conducted for the first time. Moreover, in previous studies only a few commonly mentioned macroeconomic determinants of banking credit risk are analysed, leaving other potential determinants outside the scope of the research. This research focuses on the detailed classification of banking credit risk determinants, and, when assessing the impact of macroeconomic variables on consumer loan credit risk, analyses the wide set of different proxies classified into different groups of factors influencing consumer loan credit risk. This allows choosing the best-performing (best explaining the changes in NPLs) determinants in each group.

7. Limitations and Future Research

Discussing the limitations of this research it is worth mentioning that despite the fact that academic literature indicates the non-performing loans for consumption-to-total loans ratio as a proxy of consumer loan credit risk, for CEE countries, the data of NPL for consumer loans are not available. Thus the data for retail loans NPLs were used.

Moreover, due to the problem of data availability, for CEE countries, it was not possible to apply the structural breaks and Markov regime-switching models as models allowing taking into account possible changes in the relationship between variables over a long period of time under different economic circumstances or regimes. These models were applied only to the case of Lithuania.

It is important to notice that this study, for the most part, was based on indicators analysed in studies examining the credit risk of the banking sector in relation to total lending. Due to data availability issues and other reasons, the number of studies analysing the credit risk of consumer loans separately is very low. Hence, the analysis of all NPLs (without grouping them by type of loan) is insufficient; it is necessary to separately study the credit risk of corporate, housing, and consumer loans (non-performing loans).

The impact of variables from other macroeconomic variables groups appeared to be mixed-nature or insignificant which requires further analysis. Regarding the analysis of the CEE countries, it can be stated that in some cases the analysis of the annual data did not allow for unambiguous identification of the impact of both the financial and pandemic-induced crisis; therefore, it would be appropriate to assess this impact using quarterly data (if this becomes possible).

As this study focuses on the credit risk of the banking sector, but the credit services provided by the fintech sector are becoming increasingly important, the fintech credit sector should also be examined in the future.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A
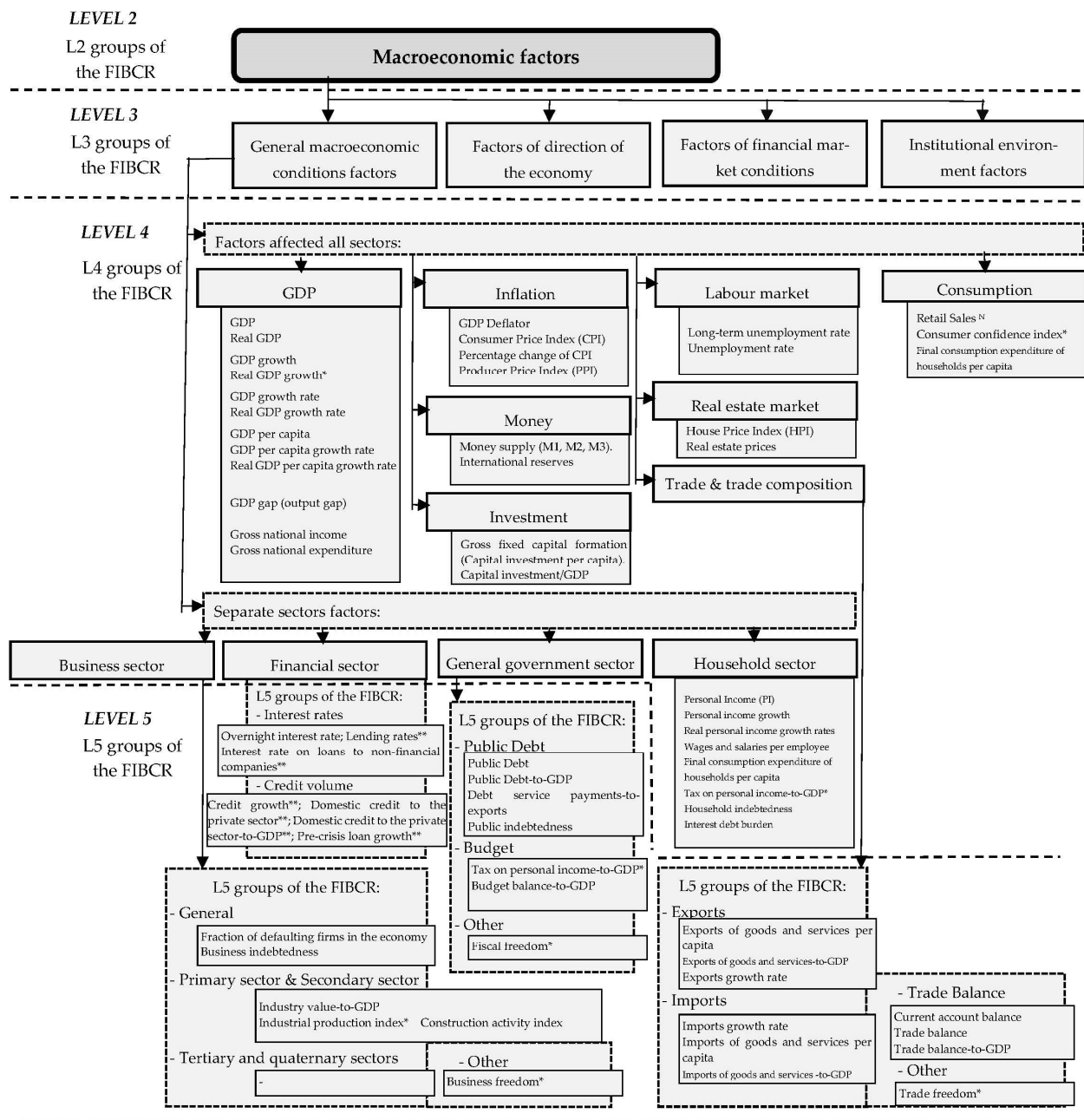
Figure A1. Classifications of macroeconomic factors influencing banking credit risk. [N] Newly proposed factor. * Factor could also be classified as (i) a factor of direction of the economy or (ii) an institutional environment factor. ** Factor could also be classified as a factor of financial market conditions.

Table A1. Theoretical and empirical research of GDP variables.

Variables	Theoretical Research		Empirical Research
	Authors (Secondary)	Authors (Primary Source)	
Directional impact: negative			
GDP	Mpofu and Nikolaidou, 2018 [20]	Ombaba, 2013, Viswanadham and Nahid, 2015	
GDP	Umar and Sun, 2018 [41]	Ghosh, 2015 [30]; Louzis et al., 2012 [18]; Espinoza and Prasad, 2010 [8]	
GDP	Priyadi et al., 2021 [31]	Firmansyah, 2014	
Real GDP rate	Nikolaidou and Vogiazas, 2017 [33]	Ghosh, 2015 [30]	
GDP growth	Gila-Gourgoura and Nikolaidou, 2018 [2]	Yurdakul, 2014 [46]	
GDP growth	Gila-Gourgoura and Nikolaidou, 2018 [2]	Messai and Jouini, 2013 [45]	
GDP growth	Mpofu and Nikolaidou, 2018 [20]	De Bock and Demynanets, 2012 [37]	
GDP growth rate			Koju, Koju, and Wang, 2020 [17]
GDP growth rate	Koju, Koju, and Wang, 2020 [17]	Salas and Saurina, 2002 [28]; Škarica, 2014; Fofack, 2005 [13]	
Real GDP growth rate			Castro, 2013 [3]
Real GDP growth rate	Mpofu and Nikolaidou, 2018 [20]	Beck et al., 2015 [21]	
Real GDP growth rate	Mpofu and Nikolaidou, 2018 [20]	Castro, 2013 [3]	
Real GDP growth rate	Mpofu and Nikolaidou, 2018 [20]	Nkusu, 2011 [15]	
Real GDP growth rate	Mpofu and Nikolaidou, 2018 [20]	Espinoza and Prasad, 2010 [8]	
Real GDP growth rate	Mpofu and Nikolaidou, 2018 [20]		
GDP per capita	Abusharbeh, 2020 [12]	Nkusu, 2011 [15], Vouldis and Louzis, 2017 [51]	
GDP per capita growth rate	Mpofu and Nikolaidou, 2018 [20]	Washington, 2014 [11]	
GDP per capital growth rate	Washington, 2014 [11]	Thiagarajan et al., 2011; Derbali, 2011; Ali and Daly, 2010 [21]	
GDP gap (output gap)	Carvalho, Curto and Primor, 2020 [42]	Bruneau et al., 2012 [79]	
GDP gap (output gap)			Dimitrios, Helen, and Mike, 2016 [29]
Gross national income (GNI) per capita growth rate			Koju, Koju, and Wang, 2020 [17]
Directional impact: insignificant			
GDP growth	Mpofu and Nikolaidou, 2018 [20]	Haniifah, 2015 [38]	Haniifah, 2015 [38]
National expenditure as a percentage of GDP			Koju, Koju, and Wang, 2020 [17]

Table A2. Research variables, symbols and data sources.

Symbol	Variable	Measurement Unit	Data Source
Dependent variables			
Y1	Non-performing loans for consumption-to-total loans	Per cent	Bank of Lithuania, Deloitte (for CEE countries)
Y2	Total loans for consumption	Mln. Eur.	ECB Statistical Data Warehouse
GDP			
X1	GDP	Mln. Eur.	ECB Statistical Data Warehouse
X2	Real GDP	Mln. of Chained 2010 Eur.	FRED Economic Data
X3	GDP growth	Per cent	Own calculations
X4	Real GDP growth rate	Per cent	Own calculations
X5	GDP per capita	Eur. per capita	OECD Statistics
X6	GDP GAP (Output gap)	Per cent	OECD Statistics
X7	Gross national income	Per cent of GDP	Worldbank Data
X8	Gross national expenditure	Per cent of GDP	CEIC Data Global Database
Inflation			
X9	GPD deflator	Per cent	CEIC Data Global Database
X10	Consumer price index (CPI)	Per cent	Eurostat
X11	Percentage change of CPI	Per cent	Own calculations
X12	Producer price index (PPI)	Per cent	OECD Statistics
Money			
X13	Money supply (M2)	Growth rate, per cent	CEIC Data Global Database
X14	International reserves	Per cent of GDP	CEIC Data Global Database
Investment			
X15	Gross fixed capital formation per capita	Percentage change	Own calculations based on Eurostat
X16	Capital investment	Per cent of GDP	The Global Economy
Labour market			
X17	Long-term unemployment rate	Per cent	OECD Statistics
X18	Unemployment rate	Per cent	Eurostat
Real estate market			
X19	House price index	Index (points, annual average)	Eurostat
Trade and trade composition			
X20	Exports of goods and services per capita	Percentage change	Own calculations based on Eurostat
X21	Exports of goods and services to GDP	Per cent	Eurostat
X22	Exports growth rate	Per cent	Own calculations based on Eurostat
X23	Imports of goods and services per capita	Percentage change	Own calculations based on Eurostat
X24	Imports of goods and services to GDP	Per cent	Eurostat
X25	Imports growth rate	Per cent	Own calculations based on Eurostat
X26	Current account balance	Per cent	Worldbank Data
X27	Trade-balance-to-GDP	Per cent	Own calculations based on CEIC Data Global Database
X28	Trade freedom	Index (points)	The Heritage Foundation

Table A2. *Cont.*

Symbol	Variable	Measurement Unit	Data Source
		Consumption	
X29	Consumer confidence index (CCI)	Index (points)	Eurostat
X30	Final consumption expenditure of households per capita	Percentage change	Own calculations based on OECD Statistics and Eurostat
		Business sector	
X31	Industrial production index	Per cent	OECD Statistics
X32	Industry-value-to-GDP	Per cent	Worldbank Data
X33	Business Freedom	Index (points)	The Heritage Foundation
		Financial sector	
X34	Overnight interest rate	Per cent	OECD Statistics
X35	Credit growth	Percentage change	CEIC Data Global Database
X36	Domestic credit to the private sector	Mln. Eur.	ECB Statistical Data Warehouse
X37	Domestic credit to private-sector-to-GDP	Per cent	Worldbank Data
X38	Interest rates on loans to non-financial companies	Per cent	OECD Statistics
		General government sector	
X39	Public debt	Mln. Eur.	Eurostat
X40	Public-debt-to-GDP	Per cent	Eurostat
X41	Budget-balance-to-GDP	Per cent	Eurostat
X42	Private-to-public indebtedness	Per cent	Own calculations based on Eurostat
		Households sector	
X30	Final consumption expenditure of households per capita	Eur.	Own calculations based on OECD Statistics and Eurostat
X43	Tax on personal-income-to-GDP	Per cent	Eurostat
X44	Wages and salaries per employee	Eur.	OECD Statistics

Source: compiled by the authors.

Table A3. Results of the unit-root (Levin, Lin and Chu and Augmented-Dickey–Fuller) tests.

Symbol	Variable	CEE		Probability	Lithuania		Probability
		t-Statistic (Levin, Lin and Chu t*)			t-Statistic (Augmented Dickey–Fuller)		
			Dependent variables				
Y1	Non-performing loans for consumption-to-total loans	−4.259	0.000 **		−5.173	0.000 **	1st diff
Y2	Total loans for consumption	−6.626	0.000 **		−5.714	0.000 **	1st diff
			GDP				
X2	Real GDP	−5.321	0.000 **	1st diff	−6.895	0.000 **	2nd diff.
X3	GDP growth	−9.354	0.000 **	2nd diff.	−6.518	0.000 **	
X4	Real GDP growth	−7.432	0.000 **	2nd diff.	−6.542	0.000 **	
X6	GDP gap (Output gap)	−7.018	0.000 **		-	-	-
X7	Gross national income	−8.760	0.000 **		−6.504	0.000 **	
X8	Gross national expenditure	−6.869	0.000 **		-	-	-

Table A3. *Cont.*

Symbol	Variable	CEE		Probability	Lithuania		Probability
		t-Statistic (Levin, Lin and Chu t*)	Probability		t-Statistic (Augmented Dickey–Fuller)	Probability	
	Inflation						
X9	GDP deflator	−3.874	0.000 **	1st diff.	−5.509	0.000 **	1st diff.
X10	Consumer price index (CPI)	−6.863	0.000 **	2nd diff.	−9.688	0.000 **	2nd diff.
X11	Percentage change of CPI	−9.999	0.000 **		−10.835	0.000 **	1st diff
X12	Producer price index (PPI)	−2.559	0.005 **		−6.015	0.000 **	1st diff.
	Money						
X13	Money supply (M2)	−2.384	0.009 **		−6.224	0.000 **	1st diff.
X14	International reserves	−11.571	0.000 **		−10.056	0.000 **	1st diff
	Investment						
X15	Gross fixed capital formation	−10.915	0.000 **		−4.812	0.000 **	
X16	Capital investment	−14.219	0.000 **		−3.459	0.012 *	
	Labour market						
X17	Long-term unemployment rate	−7.243	0.000 **	1st diff.	−3.557	0.009 **	1st diff.
X18	Unemployment rate	−4.309	0.000 **		−3.919	0.003 **	1st diff.
	Real estate market						
X19	House price index	−6.276	0.000 **	1st diff.	−3.657	0.007 **	1st diff.
	Trade and trade composition						
X20	Exports of goods and services per capita	−14.675	0.000 **		−6.239	0.000 **	
X21	Exports of goods and services to GDP	−2.163	0.015 *		−7.657	0.000 **	1st diff.
X22	Exports growth rate	−14.822	0.000 **		−6.295	0.000 **	
X23	Imports of goods and services per capita	−14.024	0.000 **		−6.678	0.000 **	
X24	Imports of goods and services-to-GDP	−2.786	0.003 **		−7.496	0.000 **	1st diff.
X25	Imports growth rate	−14.013	0.000 **		−6.674	0.000 **	
X26	Current account balance	−5.773	0.000 **		−3.107	0.031 *	1st diff.
X27	Trade-balance-to-GDP	−4.905	0.000 **		−9.415	0.000 **	1st diff.
	Consumption						
X29	Consumer confidence index (CCI)	−2.291	0.000 **		−5.079	0.000 **	1st diff.
X30	Final consumption expenditure per capita	−9.786	0.000 **	1st diff.	−6.663	0.000 **	
	Business sector						
X31	Industrial production index	−5.969	0.000 **		−6.032	0.000 **	1st diff.
X32	Industry-value-to-GDP	−3.154	0.001 **		-	-	-
X33	Business Freedom	−6.531	0.000 **	1st diff.	-	-	-
	Financial sector						
X35	Credit growth	−10.080	0.000 **		−3.342	0.017 *	
X36	Domestic credit to the private sector	−2.319	0.010 *	1st diff.	−3.678	0.007 **	1st diff.
X37	Domestic credit to private-sector-to-GDP	−5.929	0.000 **		-	-	-
	General government sector						
X39	Public debt	−4.607	0.000 **	1st diff.	−7.639	0.000 **	1st diff.
X40	Public debt/GDP	−5.748	0.000 **		−7.326	0.000 **	1st diff.
X41	Budget-balance-to-GDP	−9.339	0.000 **	1st diff.	−12.190	0.000 **	1st diff.
X42	Private-to-public indebtedness	−19.191	0.000 **		−2.916	0.049 *	1st diff.
	Households sector						
X43	Tax on personal-income-to-GDP	−10.006	0.000 **	1st diff.	-	-	-
X44	Wages and salaries per employee	−8.679	0.000 **	1st diff.	−4.808	0.000 **	1st diff.

Source: compiled by the authors. Note: 1st diff.—variable is stationary at first difference; 2nd diff.—variable is stationary at second difference; **—99% confidence level; *—95% confidence level; —-variable is non-stationary neither at first nor at second difference.

Table A4. Descriptive statistics variables of panel data models for the group of CEE countries.

Symbol	Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Sum	Sum Sq. Dev.	Observations
					Dependent variables								
Y1	Non-performing loans for consumption-to-total loans	6.127	5.200	19.200	0.300	4.055	1.104	4.021	27.412	0.000	680.100	1809.279	111
Y2	Total loans for consumption	7724.799	4443.000	48,122.00	437.000	10,037.43	2.210	7.603	235.947	0.000	1,073,747	1.39×10^{10}	139
					GDP								
X2	Real GDP	3330.078	308.450	66,325.00	−66,815.00	13,228.89	0.370	14.688	662.996	0.000	386,289.0	2.01×10^{10}	116
X3	GDP growth	−0.812	−0.169	16.268	−15.015	6.095	−0.151	3.016	0.337	0.844	−71.510	3232.720	88
X4	Real GDP growth	−1.074	−0.700	6.300	−12.200	3.805	−0.569	2.871	5.415	0.066	−106.400	1418.887	99
X6	GDP GAP (Output gap)	−1.589	−1.800	9.500	−11.800	3.749	0.248	4.327	10.539	0.005	−200.176	1757.663	126
X7	Gross national income	2.004	2.803	14.752	−12.635	3.842	−0.865	5.037	41.401	0.000	278.670	2037.848	139
X8	Gross national expenditure	98.956	98.784	119.749	90.714	4.834	0.961	4.991	45.615	0.000	14,150.71	3317.932	143
					Inflation								
X9	GDP deflator	2.396	2.040	14.512	−9.370	2.663	0.687	8.953	205.357	0.000	316.273	929.101	132
X10	Consumer price index (CPI)	1.921	2.000	5.890	−1.640	1.675	0.047	2.246	3.435	0.179	274.830	398.829	143
X11	Percentage change of CPI	2.334	2.149	15.402	−1.544	2.548	1.837	9.008	295.592	0.000	333.773	922.2449	143
X12	Producer price index	100.229	100.000	118.400	83.948	5.531	0.083	4.208	6.445	0.039	10,423.87	3150.890	104
					Money								
X13	Money supply (M2)	39.770	48.000	75.000	3.300	23.253	−0.648	1.844	19.351	0.000	6124.600	82,732.84	154
X14	International reserves	−0.777	−0.363	7.796	−21.814	4.113	−1.380	7.692	176.600	0.000	−111.204	2403.342	143
					Investment								
X15	Gross fixed capital formation per capita	3.143	3.833	41.347	−45.474	13.300	−0.769	5.603	53.343	0.000	440.149	24,604.25	140
X16	Capital-investment-to-GDP	23.241	22.650	36.950	12.470	3.903	0.627	4.107	16.695	0.000	3323.586	2164.157	143
					Labour market								
X17	Long-term unemployment rate	−0.943	−0.900	19.190	−19.044	6.186	0.463	4.525	17.399	0.0001	−123.567	4975.246	131
X18	Unemployment rate	5.464	7.350	19.700	−50.100	11.535	−3.116	13.765	863.981	0.000	732.20	17,699.01	134
					Real estate market								
X19	House price index	3.664	3.700	43.200	−45.280	11.088	−0.723	9.344	245.275	0.000	509.302	16,966.93	139
					Trade and trade composition								
X20	Exports of goods and services per capita	6.953	6.819	40.417	−25.312	11.710	−0.275	3.685	4.860	0.088	1049.912	20,569.32	151
X21	Exports of goods and services to GDP	64.813	65.619	96.288	26.023	17.426	−0.250	2.018	7.789	0.020	9981.335	46,465.34	154

Table A4. *Cont.*

Symbol	Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Sum	Sum Sq. Dev.	Observations
X22	Exports growth rate	6.582	6.580	39.663	−25.980	11.490	−0.3350	3.746	6.329	0.042	994.021	19,803.78	151
X23	Imports of goods and services per capita	5.882	6.402	33.542	−35.721	13.203	−0.660	4.219	20.333	0.000	888.313	26,150.44	151
X24	Imports of goods and services/-to-	63.791	66.046	94.499	32.449	14.762	−0.119	2.082	5.771	0.058	9823.848	33,343.60	154
X25	Imports growth rate	5.519	6.365	33.17	−36.296	13.025	−0.713	4.329	23.947	0.000	833.484	25,449.51	151
X26	Current account balance	7.560	7.266	33.069	−10.540	5.425	0.866	6.804	111.404	0.000	1156.813	4473.509	153
X27	Trade balance/GDP	18.551	18.501	66.693	0.017	14.361	0.846	3.949	24.041	0.000	2838.373	31,349.01	153
	Consumption												
X29	Consumer confidence index (CCI)	−16.867	−15.150	3.9000	−50.100	12.610	−0.468	2.413	7.73	0.01	−2563.800	24,011.28	152
X30	Final consumption expenditure per capita	51.042	90.648	4116.450	−6259.750	1341.354	−0.874	8.898	208.217	0.000	6737.611	2.36×10^8	132
	Business sector												
X31	Industrial production index	113.951	114.526	124.468	103.059	5.1590	−0.199	2.404	0.684	0.710	3646.436	825.089	32
X32	Industry-value-to-GDP	23.950	26.371	38.695	−11.600	9.896	−1.912	6.362	155.594	0.000	3448.869	14,003.58	144
X33	Business Freedom	−0.397	−0.700	10.400	−9.400	3.030	0.622	4.653	25.5005	0.000	−56.700	1304.028	143
	Financial sector												
X35	Credit growth	4827.333	6.215	67,838.00	−14.740	15,515.78	2.991	10.287	570.539	0.000	743,409.2	3.68×10^{10}	154
X36	Domestic credit to private sector	1991.087	667.500	22,432.00	−10,747.00	4867.840	2.211	9.089	325.698	0.000	274,770.0	3.25×10^9	138
X37	Domestic to private-sector-to-GDP	53.135	50.288	101.388	24.735	14.599	0.688	3.683	13.676	0.001	7385.811	29,414.82	139
	General government sector												
X39	Public debt	3611.930	1493.050	47,431.30	−19,610.30	6990.063	2.732	16.454	1142.286	0.000	469,550.9	6.30×10^9	130
X40	Public-debt-to-GDP	44.401	41.750	87.300	4.500	21.265	0.159	2.253	4.230	0.120	6837.900	69,192.85	154
X41	Budget-balance-to-GDP	−0.144	0.200	9.100	−10.60	2.878	−0.801	4.902	36.864	0.000	−20.600	1176.732	143
X42	Private-to-public indebtedness	3.671	1.918	32.865	0.948	4.704	3.342	16.113	1317.976	0.000	536.06	3208.787	146
	Household sector												
X43	Tax on personal-income-to-GDP	0.0082	0.000	3.100	−2.400	0.459	0.779	23.164	2283.636	0.000	1.100	28.001	134
X44	Wages and salaries per employee	238.506	249.6420	1080.078	−1291.876	360.262	−0.856	5.241	47.405	0.000	34,106.35	18,430,085	143

Source: compiled by the authors.

Table A5. Descriptive statistics of variables of regression models for Lithuania.

Symbol	Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Sum	Sum Sq. Dev.	Observations
						Dependent variables							
Y1	Non−performing loans for consumption–to–total loans	7.973	6.345	25.060	1.370	6.570	0.714	2.369	6.507	0.038	510.330	2719.940	67
Y2	Total loans for consumption	8.750	7.500	153.000	−248.000	55.746	−1.099	8.4103	96.643	0.000	595.000	20,8210.8	68
						GDP							
X2	Real GDP	60.080	81.000	366.600	−1028.700	175.067	−4.329	26.139	1704.006	0.000	4025.400	2,022,800	62
X3	GDP growth	−0.013	−0.042	11.538	−12.065	2.655	0.345	15.452	434.215	0.000	−0.913	465.548	62
X4	Real GDP growth	0.779	0.950	3.900	−12.900	2.111	−4.454	28.397	2052.477	0.000	53.000	298.811	62
X7	Gross national income	1.851	2.089	7.788	−12.534	2.844	−2.087	11.895	265.515	0.000	122.204	525.825	62
						Inflation							
X9	GDP deflator	0.051	−0.010	7.070	−5.030	1.994	0.289	4.600	8.080	0.017	3.450	262.549	62
X10	Consumer price index (CPI)	0.109	−0.030	3.350	−3.250	1.055	0.215	4.424	6.180	0.045	7.360	73.499	61
X11	Percentage change of CPI	0.086	−0.027	2.577	−3.600	1.066	−0.141	4.295	4.983	0.082	5.853	76.143	62
X12	Producer price index	0.542	0.899	7.700	−16.200	4.325	−1.324	5.768	40.982	0.000	36.366	1234.697	68
						Money							
X13	Money supply (M2)	−0.135	0.365	25.988	−27.795	5.602	−0.350	16.868	538.303	0.000	−9.059	2071.627	67
X14	Foreign exchange reserves	−0.121	0.042	4.492	−15.286	2.372	−3.768	26.284	1672.162	0.000	−8.140	371.398	67
						Investment							
X15	Gross fixed capital formation per capita	1.864	2.410	20.297	−22.124	8.070	−0.400	3.981	4.480	0.106	124.901	4299.272	67
X16	Capital investment	20.661	19.335	35.039	10.271	5.785	0.497	2.605	3.244	0.197	1404.970	2242.332	67
						Labour market							
X17	Long−term unemployment rate	−0.041	−0.100	1.800	−1.100	0.521	0.812	4.745	15.869	0.000	−2.800	17.922	67
X18	Unemployment rate	−0.040	−0.100	2.600	−1.600	0.873	1.076	4.264	17.400	0.000	−2.700	50.301	67
						Real estate market							
X19	House price index	1.408	1.580	10.570	−24.570	4.754	−2.593	15.803	500.941	0.000	88.760	1401.410	67
						Trade and trade composition							
X20	Exports of goods and services per capita	2.856	3.347	17.965	−17.776	6.691	−0.669	4.806	14.318	0.001	194.256	2999.828	68
X21	Exports of goods and services–to–GDP	0.355	0.300	11.300	−13.800	4.098	−0.527	5.588	21.814	0.000	23.800	1108.446	67
X22	Exports growth rate	2.605	3.102	18.089	−17.808	6.621	−0.676	4.885	15.264	0.000	177.147	2937.847	68

Table A5. *Cont.*

Symbol	Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Sum	Sum Sq. Dev.	Observations
X23	Imports of goods and services per capita	2.813	2.410	22.725	−21.876	7.959	−0.532	5.556	21.732	0.000	191.327	4244.327	68
X24	Imports of goods and services–to–GDP	0.468	0.900	8.700	−9.900000	3.483520	−0.585	4.317	8.663	0.013	31.400	800.904	67
X25	Imports growth rate	2.559	2.139	22.855	−21.906	7.850	−0.585	5.645	23.704	0.000	174.027	4128.784	68
X26	Current account balance	0.089	0.649	11.224	−11.369	4.160	−0.193	3.5347	1.216	0.544	6.028	1142.589	67
X27	Trade balance–to–GDP	−0.014	−0.075	2.364	−1.729	0.760	0.245	3.381	1.080	0.582	−0.947	38.131	67
	Consumption												
X29	Consumer confidence index (CCI)	−0.043	0.172	2.145	−4.708	1.291	−1.041	4.715	20.608	0.000	−2.896	111.689	68
X30	Final consumption expenditure per capita	1.693	1.772	9.057	−12.249	2.938	−2.057	11.644	259.700	0.000	115.136	578.556	67
	Business sector												
X31	Industrial production index	0.000	1.150	11.767	−73.373	9.913	−6.034	45.588	5551.693	0.000	0.000	6584.235	68
	Financial sector												
X35	Credit growth	11.445	4.726	69.580	−10.490	19.836	1.390	4.044	25.006	0.000	778.314	26,364.21	68
X36	Domestic credit–to–private sector	391.209	328.905	3002.100	−1467.260	834.546	0.502	3.808	4.575	0.101	25,819.80	45,270,419	66
	General government sector												
X39	Public debt	332.631	224.550	4262.220	−5261.340	1126.062	−1.046	12.371	257.401	0.000	22,286.31	83,689,024	67
X40	Public debt−to−GDP	0.401	−0.100	8.300	−3.500	2.174	1.134	4.844	23.151	0.000	26.100	302.489	67
X41	Budget balance–to–GDP	0.003	0.050	15.300	−13.900	3.014	0.446	17.757	601.068	0.000	0.200	590.619	67
X42	Private–to–public indebtedness	−0.011	−0.008	1.091	−1.073	0.312	−0.291	7.106	48.019	0.000	−0.750	6.459	67
	Households sector												
X44	Wages and salaries per capita	76.121	84.000	279.000	−497.000	111.531	−2.113	12.221	282.980	0.000	5024.000	808,555.0	67

Source: compiled by the authors.

Table A6. Results of panel regression analysis for macroeconomic determinants of consumer loan credit risk in CEE countries (non-performing loans for consumption-to-total loans ratio (Y1)).

Symbol	Variable	Coefficient	t-Statistic	Prob.	R Sq.	Observ.	F Test	Hausman Test	Model
				General Macroeconomic Conditions Factors					
				GDP					
X2	Real GDP	5.25×10^{-8}	0.003	0.998	0.001	95	0.000	0.992	Random effects
X3	GDP growth	0.181	3.501	0.001 **	0.062	85	0.000	0.399	Random effects
X4	Real GDP growth	0.229	2.713	0.008 **	0.058	93	0.000	0.017	Fixed effects
X6	GDP gap (Output gap)	−0.130	−1.014	0.313	0.011	94	0.000	0.968	Random effects
X7	Gross national income	0.024	0.231	0.463	0.001	107	0.000	0.469	Random effects
X8	Gross national expenditure	0.065	0.583	0.561	0.003	111	0.000	0.444	Random effects
				Inflation					
X9	GDP deflator	−0.857	−6.047	0.000 **	0.003	108	0.000	0.005	Fixed effects
X10	Consumer price index (CPI)	−0.516	−2.817	0.005 **	0.069	108	0.000	0.283	Random effects
X11	Percentage change of CPI	−0.397	−2.426	0.017 *	0.051	111	0.000	0.131	Random effects
X12	Producer price index (PPI)	−0.147	−1.867	0.066	0.042	82	0.000	0.582	Random effects
				Money					
X13	Money supply (M2) growth rate	−0.012	−0.747	0.456	0.005	111	0.000	0.032	Fixed effects
X14	International reserves	−0.021	−0.164	0.869	0.0002	111	0.000	0.776	Random effects
				Investment					
X15	Gross fixed capital formation per capita	−0.057	−1.771	0.077	0.031	101	0.000	0.879	Random effects
X16	Capital investment	−0.247	−1.812	0.073	0.029	111	0.000	0.745	Random effects
				Labour market					
X17	Long-term unemployment rate	0.135	2.419	0.017 *	0.049	106	0.000	0.072	Random effects
X18	Unemployment rate	−0.0001	−0.022	0.983	0.001	105	0.000	0.136	Random effects
				Real estate market					
X19	House price index	−0.233	−5.787	0.000 **	0.024	106	0.000	0.191	Random effects
				Trade and trade composition					
X20	Exports of goods and services per capita	0.053	1.649	0.102	0.024	111	0.000	0.536	Random effects
X21	Exports of goods and services to GDP	−0.032	−0.787	0.433	0.006	111	0.000	0.398	Random effects
X22	Exports growth rate	0.053	1.614	0.431	0.024	111	0.000	0.802	Random effects
X23	Imports of goods and services per capita	0.019	0.601	0.549	0.004	111	0.000	0.294	Random effects
X24	Imports of goods and services to GDP	−0.035	−0.718	0.475	0.004	111	0.000	0.379	Random effects
X25	Imports growth rate	0.018	0.561	0.576	0.002	111	0.000	0.591	Random effects
X26	Current account balance	−0.197	−3.657	0.000 **	0.110	111	0.000	0.810	Random effects
X27	Trade-balance-to-GDP	0.026	0.838	0.403	0.142	111	0.000	0.013	Fixed effects
				Consumption					
X29	Consumer confidence index (CCI)	−0.094	−3.599	0.001 **	0.107	110	0.000	0.177	Random effects
X30	Final consumption expenditure of households per capita	−0.0003	−1.546	0.465	0.003	108	0.000	0.384	Random effects
				Business sector					
X31	Industrial production index (CCI)	−0.068	−1.624	0.115	0.083	32	0.000	0.754	Random effects
X32	Industry-value-to-GDP	0.885	4.040	0.000 **	0.032	111	0.000	0.002	Fixed effects
X33	Business Freedom	0.139	1.424	0.157	0.019	108	0.000	0.144	Random effects

Table A6. *Cont.*

	General Macroeconomic Conditions Factors								
Symbol	Variable	Coefficient	t-Statistic	Prob.	R Sq.	Observ.	F Test	Hausman Test	Model
	Financial sector								
X35	Credit growth	−0.0001	−1.687	0.097	0.166	111	0.000	0.016	Fixed effects
X36	Domestic credit to private sector	−0.0001	−1.379	0.171	0.018	108	0.000	0.947	Random effects
X37	Domestic credit to private-sector-to-GDP	0.191	5.391	0.000 **	0.003	111	0.000	0.011	Fixed effects
	General government sector								
X39	Public debt	-7.76×10^{-6}	−0.238	0.812	0.002	96	0.000	0.503	Random effects
X40	Public-debt-to-GDP	0.058	1.842	0.068	0.109	111	0.000	0.750	Random effects
X41	Budget-balance-to-GDP	0.298	3.109	0.002 **	0.081	108	0.000	0.039	Fixed effects
X42	Private-to-public indebtedness	0.077	0.346	0.730	0.001	111	0.000	0.025	Fixed effects
	Household sector								
X43	Tax on personal-income-to-GDP	−0.783	−1.129	0.263	0.012	108	0.000	0.139	Random effects
X44	Wages and salaries per employee	−0.002	−2.159	0.033 *	0.149	108	0.000	0.011	Fixed effects

Source: compiled by the authors. Note: **—99% confidence level; *—95% confidence level.

Table A7. Results of ordinary least squares regression models for macroeconomic determinants of consumer loan credit risk in Lithuania (non-performing loans for consumption-to-total loans ratio (Y1)).

Symbol	Variable	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
	GDP					
X2	Real GDP	−0.003	−2.981	0.004 **	0.129	62
X3	GDP growth	−0.232	−2.902	0.005 **	0.123	62
X4	Real GDP growth	−0.232	−2.911	0.005 **	0.124	62
X7	Gross national income	−0.143	−2.223	0.029 *	0.076	62
	Inflation					
X9	GDP deflator	−0.074	−0.795	0.429	0.010	62
X10	Consumer price index (CPI)	0.045	0.233	0.817	0.001	61
X11	Percentage change of CPI	0.042	0.234	0.816	0.001	62
X12	Producer price index	−0.026	−0.609	0.545	0.006	62
	Money					
X13	Money supply (M2)	0.002	0.055	0.956	0.001	62
X14	International reserves	−0.077	−1.018	0.313	0.017	62
	Investment					
X15	Gross fixed capital formation per capita	−0.032	−1.430	0.158	0.033	62
X16	Capital investment	−0.011	−0.347	0.730	0.002	62
	Labour market					
X17	Long-term unemployment rate	0.909	2.689	0.009 **	0.108	62
X18	Unemployment rate	0.802	4.369	0.000 **	0.241	62
	Real estate market					
X19	House price index	−0.023	−0.579	0.564	0.005	61

Table A7. *Cont.*

Symbol	Variable	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
	Trade and trade composition					
X20	Exports of goods and services per capita	−0.019	−0.723	0.472	0.009	62
X21	Exports of goods and services to GDP	−0.013	−0.291	0.772	0.001	62
X22	Exports growth rate	−0.019	−0.729	0.468	0.009	62
X23	Imports of goods and services per capita	−0.021	−0.919	0.361	0.013	62
X24	Imports of goods and services to GDP	0.003	0.054	0.958	0.001	62
X25	Imports growth rate	−0.022	−0.936	0.353	0.014	62
X26	Current account balance	0.028	0.635	0.528	0.007	62
X27	Trade-balance-to-GDP	0.143	0.575	0.567	0.005	62
	Consumption					
X29	Consumer confidence index (CCI)	−0.123	−0.857	0.395	0.012	62
X30	Final consumption expenditure of households per capita	−0.158	−2.635	0.011 *	0.103	62
	Business sector					
X31	Industrial production index	−0.041	−0.855	0.386	0.012	62
	Financial sector					
X35	Credit growth	0.013	0.145	0.885	0.001	62
X36	Domestic credit to the private sector	−0.0002	−1.152	0.254	0.022	62
	General government sector					
X39	Public debt	9.54×10^{-5}	0.588	0.559	0.005	62
X40	Public-debt-to-GDP	0.161	1.946	0.056	0.059	62
X41	Budget-balance-to-GDP	0.113	1.906	0.061	0.057	62
X42	Private-to-public indebtedness	−1.286	−2.323	0.023 *	0.083	62
	Households sector					
X44	Wages and salaries per capita	−0.003	−2.298	0.025 *	0.081	62

Source: compiled by the authors. Note: **—99% confidence level; *—95% confidence level.

Table A8. Results of Least Squares with Breakpoints regression models for macroeconomic determinants of consumer loan credit risk in Lithuania (non-performing loans for consumption-to-total loans ratio (Y1)).

Symbol	Variable	Periods According to Breaks (Bai-Perron)	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
		GDP					
X2	Real GDP	2005Q2–2011Q2	−0.003	−2.779	0.007 **	0.374	25
		2011Q3–2021Q1	−0.002	−1.267	0.210		37
X3	GDP growth	2005Q2–2011Q2	−0.217	−2.827	0.006 **	0.380	25
		2011Q3–2021Q1	−0.213	−1.402	0.166		37
X4	Real GDP growth	2005Q2–2011Q2	−0.217	−2.824	0.007 **	0.380	25
		2011Q3–2021Q1	−0.213	−1.514	0.162		37
X7	Gross national income	2005Q2–2011Q2	−0.211	−3.443	0.001 **	0.399	25
		2011Q3–2021Q1	−0.552	−0.513	0.609		37

Table A8. *Cont.*

Symbol	Variable	Periods According to Breaks (Bai-Perron)	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
		Inflation					
X9	GDP deflator	2005Q2–2008Q3	−0.048	−0.283	0.778		15
		2008Q4–2011Q2	−0.079	−0.843	0.403	0.432	11
		2011Q3–2021Q1	−0.009	−0.054	0.967		39
X10	Consumer price index (CPI)	2005Q2–2008Q3	0.077	0.138	0.890		11
		2008Q4–2011Q2	0.186	0.777	0.440	0.432	13
		2011Q3–2021Q1	0.044	0.215	0.831		27
X11	Percentage change of CPI	2005Q2–2008Q3	0.061	0.146	0.885		12
		2008Q4–2011Q2	0.170	0.799	0.427	0.432	13
		2011Q3–2021Q1	0.058	0.276	0.783		37
X12	Producer price index	2005Q2–2008Q4	−0.040	−0.787	0.435		15
		2009Q1–2011Q2	−0.092	−1.296	0.200	0.545	10
		2011Q3–2021Q1	−0.082	−1.410	0.164		37
		Money					
X13	Money supply (M2)	2005Q2–2008Q4	−0.079	−1.062	0.293		15
		2009Q1–2011Q2	−0.155	−1.668	0.101	0.416	10
		2011Q3–2021Q1	0.031	1.092	0.279		37
X14	International reserves	2005Q2–2008Q3	−0.069	−0.354	0.724		14
		2008Q4–2011Q2	−0.317	1.299	0.199	0.465	11
		2011Q3–2021Q1	−0.099	−1.585	0.119		27
		Investment					
X15	Gross fixed capital formation per capita	2005Q2–2011Q2	−0.053	−2.283	0.026 *	0.337	25
		2011Q3–2021Q1	0.002	0.089	0.929		37
X16	Capital investment	2005Q2–2011Q2	−0.101	−3.024	0.004 **	0.374	25
		2011Q3–2021Q1	−0.021	−0.434	0.666		37
		Labour market					
X17	Long-term unemployment rate	2005Q2–2008Q3	0.227	0.304	0.762		14
		2008Q4–2011Q2	−0.860	−1.724	0.090	0.479	11
		2011Q3–2021Q1	0.962	1.694	0.096		37
X18	Unemployment rate	2005Q2–2011Q2	0.479	2.489	0.016 *	0.434	25
		2011Q3–2021Q1	1.058	3.208	0.002 **		37
		Real estate market					
X19	House price index	2005Q2–2008Q4	−0.014	−0.422	0.674		15
		2009Q1–2011Q2	−0.375	−1.627	0.109	0.491	10
		2011Q3–2021Q1	0.195	2.487	0.016 *		36
		Trade and trade composition					
X20	Exports of goods and services per capita	2005Q2–2008Q4	−0.013	−0.359	0.721		15
		2009Q1–2011Q2	−0.089	−2.035	0.047 *	0.459	10
		2011Q3–2021Q1	−0.025	−0.785	0.436		37

Table A8. *Cont.*

Symbol	Variable	Periods According to Breaks (Bai-Perron)	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
X21	Exports of goods and services to GDP	2005Q2–2008Q4	−0.042	−0.713	0.479	0.454	15
		2009Q1–2011Q2	−0.192	−1.878	0.066		10
		2011Q3–2021Q1	−0.023	−0.484	0.631		37
X22	Exports growth rate	2005Q2–2008Q4	−0.012	−0.349	0.728	0.475	15
		2009Q1–2011Q2	−0.091	−2.007	0.049 *		10
		2011Q3–2021Q1	−0.023	−0.716	0.477		37
X23	Imports of goods and services per capita	2005Q2–2008Q4	−0.028	−0.864	0.391	0.452	15
		2009Q1–2011Q2	−0.058	−1.716	0.092		10
		2011Q3–2021Q1	−0.017	−0.645	0.522		37
X24	Imports of goods and services to GDP	2005Q2–2008Q4	−0.007	−0.098	0.923	0.456	15
		2009Q1–2011Q2	−0.286	−2.033	0.047 *		10
		2011Q3–2021Q1	−0.032	−0.619	0.538		37
X25	Imports growth rate	2005Q2–2008Q4	−0.028	−0.861	0.393	0.451	15
		2009Q1–2011Q2	−0.061	−1.719	0.091		10
		2011Q3–2021Q1	−0.016	−0.587	0.559		37
X26	Current account balance	2005Q2–2008Q3	0.053	0.690	0.483	0.432	14
		2008Q4–2011Q2	0.035	0.562	0.575		11
		2011Q3–2021Q1	−0.008	−0.166	0.869		37
X27	Trade-balance-to-GDP	2005Q2–2008Q3	0.220	0.542	0.589	0.441	14
		2008Q4–2011Q2	0.455	1.125	0.265		11
		2011Q3–2021Q1	−0.101	−0.379	0.706		37
		Consumption					
X29	Consumer confidence index (CCI)	2005Q2–2008Q4	−0.229	−1.286	0.707	0.444	15
		2009Q1–2011Q2	−0.296	−1.268	0.210		10
		2011Q3–2021Q1	−0.008	−0.040	0.968		37
X30	Final consumption expenditure of households per capita	2005Q2–2011Q2	−0.197	−3.172	0.002 **	0.409	25
		2011Q3–2021Q1	−0.146	−1.803	0.077		37
		Business sector					
X32	Industrial production index	2005Q2–2008Q3	0.029	0.393	0.696	0.427	14
		2008Q4–2011Q2	−0.011	−0.131	0.896		11
		2011Q3–2021Q1	−0.024	−0.467	0.642		37
		Financial sector					
X35	Credit growth	2005Q2–2011Q2	−0.030	−3.361	0.001 **	0.399	25
		2011Q3–2121Q1	0.031	0.875	0.385		37
X36	Domestic credit to the private sector	2005Q2–2011Q2	−0.001	−4.038	0.000 **	0.555	25
		2011Q3–2013Q3	0.003	3.661	0.001 **		9
		2013Q4–2021Q1	-6.17×10^{-5}	−0.159	0.874		28

Table A8. *Cont.*

Symbol	Variable	Periods According to Breaks (Bai-Perron)	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
		General government sector					
X39	Public debt	2005Q2–2008Q3	−0.001	−0.232	0.817	0.562	14
		2008Q4–2011Q2	−0.001	−0.745	0.459		11
		2011Q3–2017Q4	−0.001	−3.124	0.003 **		24
		2018Q1–2021Q1	0.001	1.505	0.138		13
X40	Public-debt-to-GDP	2005Q2–2011Q2	0.219	1.719	0.091	0.317	25
		2011Q3–2021Q1	0.076	0.865	0.391		37
X41	Budget balance to GDP	2005Q2–2008Q3	−0.088	−0.392	0.697	0.654	14
		2008Q4–2011Q2	−0.214	−1.073	0.288		11
		2011Q3–2018Q1	0.205	4.879	0.000 **		25
		2018Q2–2021Q1	−0.239	−2.122	0.039 *		12
X42	Private-to-public indebtedness	2005Q2–2011Q2	−1.487	−3.706	0.001 **	0.583	25
		2011Q3–2017Q4	12.294	4.535	0.000 **		24
		2018Q1–2021Q1	−2.671	−1.585	0.119		13
		Households sector					
X44	Wages and salaries per employee	2005Q2–2011Q2	−0.005	−2.457	0.017 *	0.346	25
		2011Q3–2021Q1	0.002	0.622	0.537		37

Source: compiled by the authors. Note: **—99% confidence level; *—95% confidence level.

Table A9. Results of Markov Regime Switching models for or macroeconomic determinants of consumer loan credit risk in Lithuania (non-performing loans for consumption-to-total loans ratio (Y1)).

Symbol	Variable	Regimes	Coefficient	t-Statistic	Prob.	Log-Likelihood	Durbin-Watson
		GDP					
X2	Real GDP	Regime 1	−0.002	−1.042	0.298	−101.656	1.824
		Regime 2	−0.003	−2.511	0.012 *		
X3	GDP growth	Regime 1	−0.126	−1.379	0.167	−101.349	1.649
		Regime 2	−0.096	−0.699	0.484		
X4	Real GDP growth	Regime 1	−0.215	−2.687	0.007 **	−101.471	1.853
		Regime 2	−0.201	−1.208	0.227		
X7	Gross national income	Regime 1	1.288	2.356	0.019 *	−97.509	1.555
		Regime 2	−0.161	−3.099	0.002 **		
		Inflation					
X9	GDP deflator	Regime 1	−0.078	−0.767	0.425	−102.368	1.661
		Regime 2	0.007	0.056	0.966		
X10	Consumer price index (CPI)	Regime 1	0.243	0.338	0.735	129.679	1.327
		Regime 2	−0.065	−0.323	0.747		
X11	Percentage change of CPI	Regime 1	0.065	0.329	0.742	105.617	1.585
		Regime 2	0.148	0.653	0.513		
X12	Producer price index	Regime 1	−0.030	−0.573	0.566	−102.125	1.643
		Regime 2	−0.045	−0.893	0.371		

Table A9. *Cont.*

Symbol	Variable	Regimes	Coefficient	t-Statistic	Prob.	Log-Likelihood	Durbin-Watson
				Money			
X13	Money supply (M2)	Regime 1	0.019	0.648	0.517	106.399	1.620
		Regime 2	−0.052	−0.679	0.496		
X14	International reserves	Regime 1	−0.146	−0.516	0.605	−101.541	1.619
		Regime 2	−0.089	−1.385	0.296		
				Investment			
X15	Gross fixed capital formation per capita	Regime 1	0.821	8.173	0.000 **	−88.415	1.771
		Regime 2	−0.051	−3.458	0.001 **		
X16	Capital investment	Regime 1	−0.082	−1.296	0.195	−101.542	1.727
		Regime 2	0.026	0.695	0.487		
				Labour market			
X17	Long-term unemployment rate	Regime 1	7.113	7.034	0.000 **	−96.867	1.861
		Regime 2	0.401	1.468	0.142		
X18	Unemployment rate	Regime 1	2.538	3.517	0.000 **	−94.401	1.657
		Regime 2	0.649	4.073	0.000 **		
				Real estate market			
X19	House price index	Regime 1	−0.034	−1.086	0.277	−100.014	1.253
		Regime 2	1.793	2.245	0.025 *		
				Trade and trade composition			
X20	Exports of goods and services per capita	Regime 1	−0.005	−0.166	0.689	−101.598	1.624
		Regime 2	−0.049	−1.419	0.156		
X21	Exports of goods and service to GDP	Regime 1	−0.008	−0.171	0.864	−102.310	1.607
		Regime 2	−0.056	−0.848	0.396		
X22	Exports growth rate	Regime 1	−0.051	−1.409	0.159	−101.623	1.631
		Regime 2	−0.003	−0.109	0.913		
X23	Imports of goods and services per capita	Regime 1	−0.035	−1.216	0.224	104.899	1.617
		Regime 2	−0.002	−0.077	0.938		
X24	Imports of goods and service to GDP	Regime 1	−0.091	−0.989	0.323	−102.103	1.610
		Regime 2	−0.019	−0.368	0.713		
X25	Imports growth rate	Regime 1	−0.036	−1.211	0.226	−101.909	1.622
		Regime 2	−0.001	−0.013	0.989		
X26	Current account balance	Regime 1	−0.016	−0.614	0.538	−91.207	2.205
		Regime 2	2.150	10.004	0.000 **		
X27	Trade-balance-to-GDP	Regime 1	0.398	0.955	0.339	−102.072	1.599
		Regime 2	−0.121	−0.501	0.616		
				Consumption			
X29	Consumer confidence index (CCI)	Regime 1	−0.064	−0.345	0.729	−102.232	1.662
		Regime 2	−0.096	−0.453	0.651		
X30	Final consumption expenditure of households per capita	Regime 1	−0.196	−3.037	0.002 **	−100.081	1.909
		Regime 2	−0.141	−1.637	0.102		
				Business sector			
X31	Industrial production index	Regime 1	−0.011	−0.129	0.897	−102.681	1.638
		Regime 2	−0.012	−0.251	0.802		

Table A9. *Cont.*

Symbol	Variable	Regimes	Coefficient	t-Statistic	Prob.	Log-Likelihood	Durbin-Watson
			Financial sector				
X35	Credit growth	Regime 1	−0.030	−2.756	0.006 **	−100.328	1.709
		Regime 2	0.014	1.269	0.204		
X36	Domestic credit to the private sector	Regime 1	−0.001	−3.521	0.000 **	−97.305	1.888
		Regime 2	0.001	2.691	0.007 **		
			General government sector				
X39	Public debt	Regime 1	−0.002	2.852	0.004 **	−100.139	1.449
		Regime 2	0.001	1.803	0.071		
X40	Public-debt-to-GDP	Regime 1	0.053	0.641	0.522	−102.468	1.605
		Regime 2	−0.041	−0.220	0.826		
X41	Budget-balance-to-GDP	Regime 1	0.700	9.356	0.000 **	−92.408	1.131
		Regime 2	−0.018	−0.372	0.710		
X42	Private-to-public indebtedness	Regime 1	−1.554	−3.781	0.000 **	−94.915	1.535
		Regime 2	15.575	3.055	0.002 **		
			Households sector				
X44	Wages and salaries per employee	Regime 1	−0.003	−2.030	0.042 *	−106.787	1.487
		Regime 2	0.007	0.504	0.614		

Source: compiled by the authors. Note: **—99% confidence level; *—95% confidence level.

Table A10. Results of panel regression analysis for total loans for consumption (Y2) in CEE countries.

				General Macroeconomic Conditions Factors				
Symbol	Variable	Coefficient	t-Statistic	Prob.	R Sq.	Observ.	F Test	Hausman Test	Model
				GDP					
X2	Real GDP	−0.003	−0.159	0.873	0.078	115	0.000	0.007	Fixed effects
X3	GDP growth	−34.926	−0.951	0.344	0.011	88	0.000	0.808	Random effects
X4	Real GDP growth	−69.884	−1.205	0.231	0.015	99	0.000	0.583	Random effects
X6	GDP gal (Output gap)	24.412	0.328	0.744	0.001	115	0.000	0.098	Random effects
X7	Gross national income	−30.648	−0.515	0.607	0.002	135	0.000	0.128	Random effects
X8	Gross national expenditure	−103.971	−1.694	0.093	0.021	139	0.000	0.886	Random effects
				Inflation					
X9	GDP deflator	117.411	1.095	0.309	0.008	130	0.000	0.593	Random effects
X10	Consumer price index (CPI)	232.007	1.742	0.084	0.023	130	0.000	0.337	Random effects
X11	Percentage change of CPI	107.502	1.116	0.267	0.009	139	0.000	0.485	Random effects
X12	Producer price index (PPI)	5.379	0.097	0.923	0.001	102	0.000	0.831	Random effects
				Money					
X13	Money supply (M2)	10.489	1.115	0.267	0.009	139	0.000	0.668	Random effects
X14	International reserves	72.588	1.177	0.241	0.009	139	0.000	0.081	Random effects
				Investment					
X15	Gross fixed capital formation per capita	−15.089	−0.842	0.401	0.006	128	0.000	0.558	Random effects
X16	Capital investment	−83.957	−1.144	0.255	0.009	139	0.000	0.829	Random effects

Table A10. *Cont.*

General Macroeconomic Conditions Factors									
Symbol	Variable	Coefficient	t-Statistic	Prob.	R Sq.	Observ.	F Test	Hausman Test	Model
Labour market									
X17	Long-term unemployment rate	−44.346	−1.366	0.174	0.015	128	0.000	0.898	Random effects
X18	Unemployment rate	−141.013	−4.727	0.000 **	0.157	123	0.000	0.136	Random effects
Real estate market									
X19	House price index	23.405	0.977	0.330	0.008	127	0.000	0.804	Random effects
Trade and trade composition									
X20	Exports of goods and services per capita	−6.201	−0.307	0.759	0.001	137	0.000	0.700	Random effects
X21	Exports of goods and services to GDP	62.802	1.984	0.049 *	0.027	139	0.000	0.104	Random effects
X22	Exports growth rate	−7.218	−0.351	0.726	0.001	137	0.000	0.479	Random effects
X23	Imports of goods and services per capita	−13.067	−0.718	0.474	0.004	137	0.000	0.865	Random effects
X24	Imports of goods and services to GDP	55.332	1.372	0.172	0.013	139	0.000	0.072	Random effects
X25	Imports growth rate	−14.075	−0.761	0.448	0.004	137	0.000	0.610	Random effects
X26	Current account balance	−29.053	−0.662	0.509	0.003	139	0.000	0.086	Random effects
X27	Trade-balance-to-GDP	75.790	2.766	0.007 **	0.053	139	0.000	0.773	Random effects
Consumption									
X29	Consumer confidence index (CCI)	−7.698	−0.382	0.703	0.001	138	0.000	0.368	Random effects
X30	Final consumption expenditure of households per capita	0.206	1.231	0.221	0.012	130	0.000	0.362	Random effects
Business sector									
X31	Industrial production index	104.214	2.211	0.035 *	0.144	32	0.000	0.880	Random effects
X32	Industry-value-to-GDP	58.429	0.579	0.563	0.002	139	0.000	0.294	Random effects
X33	Business Freedom	−62.287	−0.946	0.346	0.007	130	0.000	0.251	Random effects
Financial sector									
X35	Credit growth	0.214	2.904	0.049 *	0.058	139	0.000	0.439	Random effects
X36	Domestic credit to the private sector	−0.013	−0.201	0.841	0.002	128	0.000	0.000	Fixed effects
X37	Domestic credit to private-sector-to-GDP	32.683	1.493	0.138	0.017	137	0.000	0.214	Random effects
General government sector									
X39	Public debt	0.054	1.554	0.123	0.035	118	0.000	0.000	Fixed effects
X40	Public-debt-to-GDP	−15.164	−0.619	0.537	0.003	139	0.000	0.560	Random effects
X41	Budget-balance-to-GDP	−70.621	−0.978	0.329	0.007	130	0.000	0.680	Random effects
X42	Private-to-public indebtedness	44.681	0.483	0.630	0.002	139	0.000	0.348	Random effects

Table A10. *Cont.*

General Macroeconomic Conditions Factors									
Symbol	Variable	Coefficient	t-Statistic	Prob.	R Sq.	Observ.	F Test	Hausman Test	Model
Household sector									
X43	Tax on personal income to GDP	29.291	0.066	0.947	0.001	130	0.000	0.522	Random effects
X44	Wages and salaries per employee	0.367	0.568	0.571	0.002	130	0.000	0.137	Random effects

Source: compiled by the authors. Note: **—99% confidence level; *—95% confidence level.

Table A11. Results of ordinary least squares regression models for total loans for consumption (Y2) in Lithuania.

Symbol	Variable	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
GDP						
X2	Real GDP	0.086	2.290	0.025 *	0.075	67
X3	GDP growth	7.709	2.491	0.015 *	0.087	67
X4	Real GDP growth	7.666	2.485	0.016 *	0.087	67
X7	Gross national income	8.056	3.618	0.001 **	0.169	66
Inflation						
X9	GDP deflator	2.235	0.653	0.516	0.007	67
X10	Consumer price index (CPI)	1.937	0.294	0.769	0.001	67
X11	Percentage change of CPI	1.291	0.201	0.842	0.001	68
X12	Producer price index	3.169	2.067	0.043 *	0.062	67
Money						
X13	Money supply (M2)	−0.096	−0.079	0.938	0.0001	67
X14	International reserves	−2.424	−0.844	0.401	0.011	67
Investment						
X15	Gross fixed capital formation per capita	2.066	2.555	0.013 *	0.091	67
X16	Capital investment	6.113	6.817	0.000 **	0.417	67
Labour market						
X17	Long-term unemployment rate	−19.786	−1.533	0.130	0.035	67
X18	Unemployment rate	−8.624	−1.110	0.271	0.018	67
Real estate market						
X19	House price index	−0.324	−0.212	0.833	0.001	63
Trade and trade composition						
X20	Exports of goods and services per capita	1.609	1.615	0.111	0.039	67
X21	Exports of goods and services to GDP	1.406	0.847	0.400	0.011	67
X22	Exports growth rate	1.740	1.733	0.088	0.044	67
X23	Imports of goods and services per capita	1.419	1.690	0.096	0.042	67
X24	Imports of goods and services to GDP	0.666	0.339	0.736	0.002	67
X25	Imports growth rate	1.531	1.803	0.076	0.047	67
X26	Current account balance	−0.037	−0.023	0.982	0.0001	67
X27	Trade-balance-to-GDP	−12.513	−1.411	0.163	0.029	67

Table A11. *Cont.*

Symbol	Variable	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
		Consumption				
X29	Consumer confidence index (CCI)	−2.543	−0.479	0.633	0.003	68
X30	Final consumption expenditure per capita	5.952	2.694	0.009 **	0.100	67
		Business sector				
X31	Industrial production index	−0.679	−0.989	0.326	0.015	68
		Financial sector				
X35	Credit growth	1.538	5.250	0.000 **	0.299	67
X36	Domestic credit to the private sector	0.047	7.939	0.000 **	0.496	66
		General government sector				
X39	Public debt	−0.014	−2.448	0.017 *	0.084	67
X40	Public-debt-to-GDP	−6.736	−2.155	0.035 *	0.068	65
X41	Budget-balance-to-GDP	6.273	2.893	0.005 **	0.116	66
X42	Private-to-public indebtedness	95.772	5.213	0.000 **	0.295	67
		Households sector				
X44	Wages and salaries per employee	0.125	2.247	0.028 *	0.073	66

Source: compiled by the authors. Note: **—99% confidence level; *—95% confidence level.

Table A12. Results of Least Squares with Breakpoints regression models for total loans for consumption (Y2) in Lithuania.

Symbol	Variable	Periods According to Breaks (Bai-Perron)	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
		GDP					
X2	Real GDP	2005Q2–2008Q3	0.072	0.587	0.559	0.413	14
		2008Q4–2021Q4	0.053	1.671	0.099		53
X3	GDP growth	2005Q2–2008Q3	4.611	0.505	0.615	0.087	14
		2008Q4–2021Q4	4.347	1.610	0.112		53
X4	Real GDP growth	2005Q2–2008Q3	4.629	0.504	0.616	0.410	14
		2008Q4–2021Q4	4.340	1.615	0.111		53
X7	Gross national income	2005Q2–2008Q3	−1.869	−0.237	0.813	0.431	14
		2008Q4–2021Q3	4.628	2.258	0.028 *		52
		Inflation					
X9	GDP deflator	2005Q2–2008Q3	−4.144	−0.690	0.495	0.507	14
		2008Q4–2011Q4	0.873	0.266	0.791		13
		2012Q1–2021Q3	2.381	0.460	0.640		40
X10	Consumer price index (CPI)	2005Q3–2008Q3	13.601	0.910	0.366	0.511	13
		2008Q4–2011Q4	−12.256	−1.448	0.153		13
		2012Q1–2021Q4	6.717	1.072	0.288		41
X11	Percentage change of CPI	2005Q2–2008Q3	10.779	0.920	0.361	0.508	14
		2008Q4–2011Q4	−10.805	−1.402	0.166		13
		2012Q1–2021Q4	5.975	0.878	0.383		41

Table A12. *Cont.*

Symbol	Variable	Periods According to Breaks (Bai-Perron)	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
X12	Producer price index (PPI)	2005Q2–2008Q3	−2.320	−0.692	0.491	0.517	14
		2008Q4–2011Q4	1.006	0.585	0.561		13
		2012Q1–2021Q3	2.126	1.113	0.261		40
Money							
X13	Money supply (M2)	2005Q2–2008Q3	−0.478	−0.152	0.879	0.536	14
		2008Q4–2011Q4	5.032	2.124	0.038 *		13
		2012Q1–2021Q4	−0.321	−0.330	0.742		40
X14	International reserves	2005Q2–2008Q3	8.550	1.313	0.194	0.578	14
		2008Q4–2011Q4	−23.782	−3.034	0.004 **		13
		2012Q1–2021Q4	−1.023	−0.480	0.633		40
Investment							
X15	Gross fixed capital formation per capita	2005Q2–2008Q3	1.021	0.617	0.539	0.519	14
		2008Q4–2011Q4	1.267	1.348	0.183		13
		2012Q1–2021Q4	−0.415	−0.491	0.689		14
X16	Capital investment	2005Q2–2012Q1	8.721	7.941	0.000 **	0.517	28
		2012Q2–2021Q4	2.718	1.679	0.098		39
Labour market							
X17	Long-term unemployment rate	2005Q2–2008Q3	21.522	0.821	0.415	0.549	14
		2008Q4–2011Q4	34.536	2.347	0.022 *		13
		2012Q1–2021Q4	−9.640	−0.527	0.599		40
X18	Unemployment rate	2005Q2–2008Q3	−3.087	−0.262	0.794	0.504	14
		2008Q4–2011Q4	4.090	0.479	0.633		13
		2012Q1–2021Q4	−2.902	−0.242	0.809		40
Real estate market							
X19	House price index	2005Q2–2008Q3	−0.311	−0.234	0.816	0.435	14
		2008Q4–2020Q4	4.774	2.875	0.066		49
Trade and trade composition							
X20	Exports of goods and services per capita	2005Q2–2008Q3	−0.243	−0.145	0.885	0.517	14
		2008Q4–2011Q4	1.721	1.390	0.169		13
		2012Q1–2021Q4	0.241	0.217	0.829		40
X21	Exports of goods and services to GDP	2005Q2–2008Q3	−1.578	−0.484	0.623	0.513	14
		2008Q4–2011Q4	2.339	1.083	0.283		13
		2012Q1–2021Q4	0.562	0.344	0.732		40
X22	Exports growth rate	2005Q2–2008Q3	−0.138	−0.082	0.935	0.517	14
		2008Q4–2011Q4	1.819	1.427	0.159		13
		2012Q1–2021Q4	0.260	0.234	0.816		40
X23	Imports of goods and services per capita	2005Q2–2008Q3	−0.927	−0.516	0.608	0.514	14
		2008Q4–2011Q4	1.062	1.086	0.282		13
		2012Q1–2021Q4	0.417	0.452	0.653		40

Table A12. *Cont.*

Symbol	Variable	Periods According to Breaks (Bai-Perron)	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
X24	Imports of goods and services to GDP	2005Q2–2008Q3	−0.349	−0.108	0.914	0.519	14
		2008Q4–2011Q4	4.602	1.496	0.139		13
		2021Q1–2021Q4	0.019	0.011	0.992		40
X25	Imports growth rate	2005Q2–2008Q3	−0.825	−0.454	0.652	0.514	14
		2008Q4–2011Q4	1.139	1.121	0.266		13
		2012Q1–2021Q4	0.429	0.465	0.644		40
X26	Current account balance	2005Q2–2008Q3	2.789	1.055	0.296	0.519	14
		2008Q4–2011Q4	2.102	0.976	0.333		13
		2012Q1–2021Q4	−0.953	−0.571	0.570		40
X27	Trade-balance-to-GDP	2005Q2–2008Q3	0.599	0.042	0.967	0.511	14
		2008Q4–2011Q4	−3.956	−0.277	0.782		13
		2012Q1–2021Q4	−9.509	−1.105	0.274		40
Consumption							
X29	Consumer confidence index	2005Q2–2008Q3	−2.156	−0.246	0.807		14
		2008Q4–2011Q4	5.581	0.936	0.353		13
		2012Q1–2021Q1	−6.398	−0.988	0.327		41
X30	Final consumption expenditure of households per capita	2005Q2–2008Q3	−2.564	−0.374	0.709	0.406	14
		2008Q4–2021Q4	2.099	1.481	0.144		53
Business sector							
X31	Industrial production index	2005Q2–2008Q4	3.083	1.505	0.137		15
		2009Q1–2011Q4	12.464	2.668	0.009 **		12
		2012Q1–2021Q1	−1.038	−2.043	0.045 *		41
Financial sector							
X35	Credit growth	2005Q2–2008Q3	−1.299	−1.705	0.093	0.533	14
		2008Q4–2011Q4	−0.749	−0.577	0.566		13
		2012Q1–2021Q4	1.044	1.041	0.302		40
X36	Domestic credit to the private sector	2005Q2–2008Q3	0.003	0.210	0.834	0.567	14
		2008Q4–2021Q3	0.045	5.307	0.000 **		52
General government sector							
X39	Public debt	2005Q2–2008Q3	0.039	1.141	0.258	0.637	14
		2008Q4–2011Q4	−0.062	−4.584	0.000 **		13
		2021Q1–2021Q4	−0.003	−0.756	0.453		40
X40	Public-debt-to-GDP	2005Q2–2008Q3	11.583	1.048	0.298	0.554	14
		2008Q4–2011Q4	−12.531	−2.298	0.025 *		13
		2021Q1–2021Q2	0.768	0.281	0.779		38
X41	Budget-balance-to-GDP	2005Q2–2008Q3	−1.841	−0.242	0.809	0.718	14
		2008Q4–2011Q4	14.794	6.808	0.000 **		13
		2021Q1–2021Q3	0.693	0.422	0.675		39

Table A12. *Cont.*

Symbol	Variable	Periods According to Breaks (Bai-Perron)	Coefficient	t-Statistic	Prob.	R Sq.	Observ.
X42	Private-to-public indebtedness	2005Q2–2008Q3	−18.513	−0.567	0.573	0.510	14
		2008Q4–2021Q4	86.351	3.992	0.000 **		53
Households sector							
X44	Wages and salaries per employee	2005Q2–2008Q3	−0.113	−0.681	0.498	0.421	14
		2008Q4–2021Q3	0.097	1.894	0.063		52

Source: compiled by the authors. Note: **—99% confidence level; *—95% confidence level.

Table A13. Results of Markov Regime Switching models for total loans for consumption (Y2) in Lithuania.

Symbol	Variable	Regimes	Coefficient	t-Statistic	Prob.	Log-Likelihood	Durbin-Watson
GDP							
X2	Real GDP	Regime 1	0.052	1.524	0.127	−350.903	2.141
		Regime 2	0.112	1.086	0.277		
X3	GDP growth	Regime 1	4.262	1.473	0.141	−351.073	2.114
		Regime 2	8.062	9.362	0.389		
X4	Real GDP growth	Regime 1	8.104	0.869	0.385	−351.064	2.116
		Regime 2	4.257	1.472	0.141		
X7	Gross national income	Regime 1	32.710	1.481	0.139	−342.603	1.635
		Regime 2	7.362	3.936	0.000 **		
Inflation							
X9	GDP deflator	Regime 1	2.329	0.753	0.451	−352.078	1.997
		Regime 2	−3.564	−0.598	0.549		
X10	Consumer price index (CPI)	Regime 1	−58.523	−0.775	0.439	−365.245	1.359
		Regime 2	1.577	0.269	0.788		
X11	Percentage change of CPI	Regime 1	−1.465	−0.239	0.811	−359.309	1.829
		Regime 2	9.811	0.740	0.459		
X12	Producer price index (PPI)	Regime 1	1.560	1.071	0.285	−251.782	1.999
		Regime 2	−2.333	−0.598	0.550		
Money							
X13	Money supply (M2)	Regime 1	−0.289	−0.045	0.964	−352.397	1.932
		Regime 2	0.611	0.580	0.562		
X14	International reserves	Regime 1	−3.542	−1.458	0.145	−350.761	1.986
		Regime 2	−3.565	−2.306	0.266		
Investment							
X15	Gross fixed capital formation per capita	Regime 1	2.535	0.884	0.377	−351.212	2.038
		Regime 2	0.964	1.133	0.257		
X16	Capital investment	Regime 1	5.815	8.752	0.000 **	−327.510	1.899
		Regime 2	1.817	0.019	0.985		
Labour market							
X17	Long-term unemployment rate	Regime 1	−31.914	−2.961	0.003 **	−349.819	1.602
		Regime 2	153.148	2.255	0.024 *		
X18	Unemployment rate	Regime 1	171.437	4.006	0.000 **	−351.173	1.412
		Regime 2	−16.327	−2.523	0.011 *		

Table A13. *Cont.*

Symbol	Variable	Regimes	Coefficient	t-Statistic	Prob.	Log-Likelihood	Durbin-Watson
			Real estate market				
X19	House price index	Regime 1	−0.293	−0.189	0.849	−330.887	1.999
		Regime 2	4.757	1.782	0.075		
			Trade and trade composition				
X20	Exports of goods and services per capita	Regime 1	0.950	1.005	0.315	−353.028	1.951
		Regime 2	−0.144	−0.066	0.948		
X21	Exports of goods and services to GDP	Regime 1	−9.920	−1.579	0.114	−352.145	1.964
		Regime 2	−1.537	−0.408	0.683		
X22	Exports growth rate	Regime 1	−0.023	−0.064	0.949	−351.939	1.949
		Regime 2	1.038	1.086	0.278		
X23	Imports of goods and services per capita	Regime 1	0.856	1.127	0.259	−351.796	1.979
		Regime 2	−0.914	−0.426	0.670		
X24	Imports of goods and services to GDP	Regime 1	−0.166	−0.064	0.949	−352.495	1.937
		Regime 2	0.732	0.414	0.679		
X25	Imports growth rate	Regime 1	−0.798	−0.365	0.716	−351.728	1.977
		Regime 2	0.926	1.202	0.229		
X26	Current account balance	Regime 1	45.711	3.523	0.000 **	−354.346	1.339
		Regime 2	−0.604	−0.417	0.677		
X27	Trade-balance-to-GDP	Regime 1	−634.462	−6.206	0.000 **	−352.919	1.484
		Regime 2	−10.185	−1.449	0.147		
			Consumption				
X29	Consumer confidence index (CCI)	Regime 1	−1.977	−0.154	0.877	−359.606	1.881
		Regime 2	1.475	0.259	0.796		
X30	Final consumption expenditure of households per capita	Regime 1	−2.522	−0.333	−0.730	−351.412	1.976
		Regime 2	2.950	1.425	0.154		
			Business sector				
X31	Industrial production index	Regime 1	−0.417	−0.671	0.502	−359.256	1.748
		Regime 2	2.173	1.351	0.177		
			Financial sector				
X35	Credit growth	Regime 1	−46.772	−1.954	0.051	−338.486	1.432
		Regime 2	1.423	6.016	0.000 **		
X36	Domestic credit to the private sector	Regime 1	0.173	10.733	0.000 **	−318.307	2.426
		Regime 2	0.038	9.271	0.000 **		
			General government sector				
X39	Public debt	Regime 1	0.039	0.889	0.374	−349.353	1.928
		Regime 2	−0.001	−2.292	0.022 *		
X40	Public-debt-to-GDP	Regime 1	−4.488	−1.676	0.094	−340.529	2.110
		Regime 2	11.385	0.885	0.377		
X41	Budget-balance-to-GDP	Regime 1	1.299	0.717	0.474	−335.612	1.426
		Regime 2	20.963	8.372	0.000 **		
X42	Private-to-public indebtedness	Regime 1	889.857	3.974	0.000 **	−339.037	2.164
		Regime 2	85.887	5.895	0.000 **		

Table A13. *Cont.*

Symbol	Variable	Regimes	Coefficient	t-Statistic	Prob.	Log-Likelihood	Durbin-Watson
		Households sector					
X44	Wages and salaries per employee	Regime 1	0.095	1.801	0.072	−345.845	2.050
		Regime 2	−0.120	−0.678	0.497		

Source: compiled by the authors. Note: **—99% confidence level; *—95% confidence level.

Table A14. Summary of the results for total loans for consumption (Y2).

Symbol	Variable	CEE Panel Estimation	Lithuania Simple Regression	Lithuania Regression with Structural Breaks	Lithuania under Different Regimes
		GDP			
X2	Real GDP	Insignificant	Sign. Positive	Insignificant	Insignificant
X3	GDP growth	Insignificant	Sign. Positive	Insignificant	Insignificant
X4	Real GDP growth	Insignificant	Sign. Positive	Insignificant	Insignificant
X6	Output gap	Insignificant	-	-	-
X7	Gross national income	Insignificant	Sign. Positive	Sign. positive (2008Q4–2021Q3)/Insig.	Sign. positive/Insig.
X8	Gross national expenditure	Insignificant	-	-	-
		Inflation			
X9	GDP deflator	Insignificant	Insignificant	Insignificant	Insignificant
X10	Consumer price index (CPI)	Insignificant	Insignificant	Insignificant	Insignificant
X11	Percentage change of CPI	Insignificant	Insignificant	Insignificant	Insignificant
X12	Producer price index (PPI)	Insignificant	Sign. Positive	Insignificant	Insignificant
		Money			
X13	Money supply (M2)	Insignificant	Insignificant	Sign. positive (2008Q4–2011Q4)/Insig.	Insignificant
X14	International reserves	Insignificant	Insignificant	Sign. negative (2008Q4–2011Q4)/Insig.	Insignificant
		Investment			
X15	Gross fixed capital formation per capita	Insignificant	Sign. Positive	Sign. Positive	Insignificant
X16	Capital investment	Insignificant	Sign. Positive	Sign. positive (2005Q2–2012Q1)/Insig.	Sign. Positive/Insig.
		Labour market			
X17	Long-term unemployment rate	Insignificant	Insignificant	Sign. positive (2008Q4–2011Q4)/Insig.	Sign. Positive/Sign. negative
X18	Unemployment rate	Sign. negative	Insignificant	Insignificant	Sign. Positive/Sign. negative
		Real estate market			
X19	House price index	Insignificant	Insignificant		Insignificant
		Trade and trade composition			
X20	Exports of goods and services per capita	Insignificant	Insignificant	Insignificant	Insignificant
X21	Exports of goods and services to GDP	Sign. Positive	Insignificant	Insignificant	Insignificant
X22	Exports growth rate	Insignificant	Insignificant	Insignificant	Insignificant
X23	Imports of goods and services to GDP	Insignificant	Insignificant	Insignificant	Insignificant
X24	Imports of goods and services per capita	Insignificant	Insignificant	Insignificant	Insignificant

Table A14. *Cont.*

Symbol	Variable	CEE Panel Estimation	Lithuania Simple Regression	Lithuania Regression with Structural Breaks	Lithuania under Different Regimes
X25	Imports growth rate	Insignificant	Insignificant	Insignificant	Insignificant
X26	Current account balance	Insignificant	Insignificant	Insignificant	Sign. Positive/Insig.
X27	Trade balance to GDP	Sign. Positive	Insignificant	Insignificant	Sign. Negative/Insig.
Consumption					
X29	Consumer confidence index (CCI)	Insignificant	Insignificant		
X30	Final consumption expenditure per capita	Insignificant	Sign. Positive	Insignificant	Insignificant
Business sector					
X31	Industrial production index	Sign. Positive	Insignificant	Sign. positive (2009Q1–2011Q4)/Sign. Negative (2012Q1–2021Q1)/Insig.	Insignificant
X32	Industry-value-to-GDP	Insignificant	-	-	-
X33	Business Freedom	Insignificant	-	-	-
Financial sector					
X35	Credit growth	Sign. Positive	Sign. Positive	Insignificant	Sign. Positive/Insig.
X36	Domestic credit to the private sector	Insignificant	Sign. Positive	Sign. positive (2008Q4–2021Q3)/Insig.	Sign. Positive
X37	Domestic credit to private-sector-to-GDP	Insignificant	-	-	-
General government sector					
X39	Public debt	Insignificant	Sign. Negative	Sign. negative (2008Q4–2011Q4)/Insig.	Sign. Negative/Insig.
X40	Public-debt-to-GDP	Insignificant	Sign. Negative	Sign. negative (2008Q4–2011Q4)/Insig.	Insignificant
X41	Budget-balance-to-GDP	Insignificant	Sign. Positive	Sign. positive (2008Q4–2011Q4)/Insig.	Sign. Positive/Insig
X42	Private-to-public indebtedness	Insignificant	Sign. Positive	Sign. positive (2008Q4–2021Q4)/Insig.	Sign. Positive
Households sector					
X43	Tax on personal income to GDP	Insignificant	-		-
X44	Wages and salaries per employee	Insignificant	Sign. Positive	Insignificant	Insignificant

Table A15. Summary of the results for non-performing loans for consumption-to-total loans ratio (Y1).

Symbol	Variable	CEE Panel Estimation	Lithuania Ordinary Least Squares Regression	Lithuania Least Squares with Breakpoints Regression	Lithuania Markov Regime-Switching Model	Results of Hypothesis Testing
Dependent variable—Y1—Non-performing loans for consumption-to-total loans						
GDP						
X2	Real GDP	Insignificant	Sign. Negative	Sign. Negative (2005Q2–2011Q2)/Insig.	Sign. Negative/Insig.	
X3	GDP growth	Sign. Positive	Sign. Negative	Sign. Negative (2005Q2–2011Q2)/Insig.	Insignificant	**H1:** CEE—not supported; Lithuania—supported
X4	Real GDP growth	Sign. Positive	Sign. Negative	Sign. Negative (2005Q2–2011Q2)/Insig.	Sign. Negative/Insig.	
X6	Output gap	Insignificant	-	-	-	
X7	Gross national income	Insignificant	Sign. Negative	Sign. Negative (2005Q2–2011Q2)/Insig.	Sign. Negative/ Sign. Positive	

Table A15. *Cont.*

Symbol	Variable	CEE Panel Estimation	Lithuania Ordinary Least Squares Regression	Lithuania Least Squares with Breakpoints Regression	Lithuania Markov Regime-Switching Model	Results of Hypothesis Testing
X8	Gross national expenditure	Insignificant	-	-	-	
Inflation						
X9	GDP deflator	Sign. Negative	Insignificant	Insignificant	Insignificant	**H2:** CEE—supported; Lithuania—supported
X10	Consumer confidence index (CPI)	Sign. Negative	Insignificant	Insignificant	Insignificant	
X11	Percentage change of CPI	Sign. Negative	Insignificant	Insignificant	Insignificant	
X12	Producer price index	Insignificant	Insignificant	Insignificant	Insignificant	
Money						
X13	Money supply (M2)	Insignificant	Insignificant	Insignificant	Insignificant	**H3:** CEE—not supported; Lithuania—not supported
X14	International reserves	Insignificant	Insignificant	Insignificant	Insignificant	
Investment						
X15	Gross fixed capital formation per capita	Insignificant	Insignificant	Sign. Negative (2005Q2–2011Q2)/Insig.	Sign. Negative/ Sign. Positive	**H4:** CEE—not supported; Lithuania—partially supported
X16	Capital investment	Insignificant	Insignificant	Sign. Negative (2005Q2–2011Q2)/Insig.	Insignificant	
Labour market						
X17	Long-term unemployment rate	Sign. Positive	Sign. Positive	Insignificant	Sign. Positive/Insig.	**H5:** CEE—supported; Lithuania—supported
X18	Unemployment rate	Insignificant	Sign. Positive	Sign. positive	Sign. Positive	
Real estate market						
X19	House price index	Sign. negative	Insignificant	Sign. Positive (2011Q3–2021Q1)/Insig.	Sign. Positive/Insig.	**H6:** CEE—supported; Lithuania—not supported
Trade and trade composition						
X20	Exports of goods and services per capita	Insignificant	Insignificant	Sign. Negative (2009Q1–2011Q2)/Insig.	Insignificant	**H7:** CEE—supported; Lithuania—neither rejected nor supported
X21	Exports of goods and service to GDP	Insignificant	Insignificant	Insignificant	Insignificant	
X22	Exports growth rate	Insignificant	Insignificant	Sign. Negative (2009Q1–2011Q2)/Insig.	Insignificant	
X23	Imports of goods and services per capita	Insignificant	Insignificant	Insignificant	Insignificant	
X24	Imports of goods and service-ti-GDP	Insignificant	Insignificant	Sign. Negative (2009Q1–2011Q2)/Insig.	Insignificant	
X25	Imports growth rate	Insignificant	Insignificant	Insignificant	Insignificant	
X26	Current account balance	Sign. negative	Insignificant	Insignificant	Sign. Positive/Insig.	
X27	Trade-balance-to-GDP	Insignificant	Insignificant	Insignificant	Insignificant	
Consumption						
X29	Consumer confidence index (CCI)	Sign. negative	Insignificant	Insignificant	Insignificant	**H8:** CEE—partially supported; Lithuania—partially supported
X30	Final consumption expenditure of households per capita	Insignificant	Sign. Negative	Sign. Negative (2005Q2–2011Q2)/Insig.	Sign. Negative/Insig.	
Business sector						
X31	Industrial production index	Insignificant	Insignificant	Insignificant	Insignificant	**H9:** CEE—supported; Lithuania—supported
X32	Industry value/GDP	Sign. positive	-	-	-	

Table A15. *Cont.*

Symbol	Variable	CEE Panel Estimation	Lithuania Ordinary Least Squares Regression	Lithuania Least Squares with Breakpoints Regression	Lithuania Markov Regime-Switching Model	Results of Hypothesis Testing
X33	Business Freedom	Insignificant	-	-	-	
Financial sector						
X34	Credit growth	Insignificant	Insignificant	Sign. Negative (2005Q2–2011Q2)/Insig.	Sign. Negative/Insig.	**H10:** CEE—partially supported; Lithuania—not supported
X36	Domestic credit to the private sector	Insignificant	Insignificant	Sign. Negative (2005Q2–2011Q2)/ Sign. Positive (2011Q3–2013Q3) /Insig.	Sign. Negative/ Sign. Positive	
X37	Domestic credit to private-sector-to-GDP	Sign. Positive	-	-	-	
General government sector						
X39	Public debt	Insignificant	Insignificant	Sign. Negative (2011Q3–2017Q4)/Insig.	Sign. Negative/Insig.	**H11:** CEE—supported; Lithuania—not supported
X40	Public-debt-to-GDP	Insignificant	Insignificant	Insignificant	Insignificant	
X41	Budget-balance-to-GDP	Sign. Negative	Insignificant	Sign. Negative (2018Q2–2021Q1)/ Sign. Positive (2011Q3–2018Q1) /Insig.	Sign. Positive/Insig.	
X42	Private-to-public indebtedness	Insignificant	Sign. Negative	Sign. Negative (2005Q2–2011Q2)/ Sign. Positive (2011Q3–2017Q4) /Insig.	Sign. Negative/ Sign. Positive	
Households sector						
X43	Tax on personal income to GDP	Insignificant	-	-	-	**H12:** CEE—neither rejected nor supported; Lithuania—neither rejected nor supported
X44	Wages and salaries per employee	Sign. negative	Sign. Negative	Sign. Negative (2005Q2–2011Q2)/Insig.	Sign. Negative/Insig.	

Source: compiled by the authors.

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