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THE CREDIT AND FINANCIAL CYCLE IN BULGARIA,  
ITS INTERACTION WITH THE BUSINESS CYCLE AND  
THE MACROPRUDENTIAL POLICY

ABSTRACT OF A DOCTORAL THESIS

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The dissertation consists of an introduction, five chapters, conclusion, two appendices, a list of references, a list of figures, a list of tables and a list of commonly used abbreviations. The total volume is 200 pages, which contain 28 tables, 18 graphs and 158 titles of used literature, of which 149 literary sources in English and 9 sources in Bulgarian.

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# Part I General characteristics of the dissertation

## 1.1 Relevance of the research topic

The importance of credit for the macroeconomy is indisputable. The access of economic agents to bank lending is essential for the financing of the operational activity and investment projects of enterprises and of the current consumption of households. The role of bank credit in the economy is further strengthened if firms and households have limited access to alternative sources of financing.

Periods accompanied by high credit growth are very often associated with overheating of the economy and accumulation of risks in the financial system, which with the reversal of the cycle phase begin to materialize and generate losses for both borrowers and creditors. At the same time, periods accompanied by stunted credit growth due to insufficient demand or tight credit policy by banks due to macroeconomic uncertainty, unprofitability of potential investment projects or negative assessments of the creditworthiness of potential borrowers are associated with limited growth of investment, consumption and gross domestic product respectively.

The study of the nature of the credit cycle and the driving forces of the ups and downs in the financial system are a subject of in-depth analysis in the academic literature. A large number of studies have shown that credit expansion is one of the main factors leading to the outbreak of financial crises and that periods characterized by excessive credit growth are in many cases followed by banking crises and a decline in real economic activity. This issue has become even more important in the light of the global financial and economic crisis of 2008-2009, which is another crisis proving the strong adverse impact of fluctuations in the financial system on economic activity.

In the academic literature, the deviation of the credit-to-GDP ratio from its long-term trend is traditionally used to measure the credit cycle. A positive deviation of this ratio from its long-term average is associated with periods of excessive credit growth due to optimistic attitudes and expectations of economic agents for the general macroeconomic environment, favorable labor market developments, growing incomes, consumption and investment and higher propensity to take risks, both on the part of borrowers and on the part of credit intermediaries. At the same time, a negative deviation of the credit-to-GDP ratio from its long-term trend is associated with periods of slowdown or decline in economic activity, declining investment and unfavorable labor

market trends associated with rising unemployment and lower incomes. As a result, the risks accumulated during the ascending phase of the cycle begin to materialize. The lack of sufficiently profitable investment projects, declining corporate profits and household incomes create difficulties in servicing accumulated liabilities to banks. This is reflected both in the tightening of standards for lending by credit institutions and unwillingness to take additional risks, and in the limited demand for credit by companies and households.

Despite the central role of the credit-to-GDP ratio in measuring fluctuations in the financial system, the modern literature assumes that the deviation of this ratio from its long-term trend is not a sufficiently reliable indicator to signal the accumulation of cyclical risks. In this regard, more and more research is focused on measuring cyclical fluctuations in the financial system using a set of indicators. The term 'credit cycle' is replaced by a broader term 'financial cycle', which takes into account the deviation from the long-term average not only of the credit-to-GDP ratio, but also of a number of other macroeconomic and financial indicators, the aggregated information of which gives a more broad picture of the accumulation of cyclical risks in the financial system.

Increasing attention in the literature is paid not only to the study of the financial cycle, but also to the investigation of the relationship between the financial cycle and the business cycle. The study of the drivers of cyclical fluctuations in the financial system and the way in which the financial and business cycles interact is essential for taking informed decision, when applying the macroprudential policy instruments of the central bank.

## **1.2 Aims and objectives of the study**

The main goal of the dissertation is to study the credit and financial cycle in Bulgaria and its interaction with the business cycle. To achieve this goal, in the first place the dissertation aims at identifying the main factors influencing the dynamics of credit in Bulgaria. This analysis is carried out first at the macro level using aggregate macroeconomic indicators and then at the micro level, using individual banks data, whereby a distinction is made between credit demand and credit supply factors. After determining the main factors for the credit dynamics in Bulgaria, the study aims to present an assessment of the credit cycle by measuring the deviation of the credit-to-GDP ratio from its long-term trend. In order to deepen the analysis and given the relatively limited information which gives the deviation of the credit-to-GDP ratio from the long-term trend for the cyclical fluctuations in the financial system, the dissertation aims at deriving an aggregate measure of the financial cycle in the Bulgarian economy by aggregating the information from a wide range of macroeconomic and financial indicators. After the derivation of an aggregate measure of the financial cycle in Bulgaria, the dissertation aims to present an assessment of the business cycle, based on certain structural characteristics of the Bulgarian economy. The next step in the analysis is to compare the assessed financial cycle and business cycle and test the hypothesis of whether and to what extent the two cycles are synchronized. Finally,

the study aims to use the assessment of the financial cycle to propose an approach for decision-making when implementing the macro-prudential policy instruments of the central bank.

### **1.3 Object and subject of the study**

In line with the set goals and objectives of the dissertation, an object and subject of the study can be formulated.

Object of the study are the cyclical fluctuations in the financial system, measured by the deviation of a set of financial and macroeconomic indicators from their long-term trend and the relationship between these fluctuations and the deviation of real gross domestic product from potential. The study covers the period from the first quarter of 1999 to the fourth quarter of 2019.

Subject of the study are the possibilities for using the assessment of the financial cycle in the decision-making process on the macroprudential policy of the central bank and in particular on the level of the countercyclical capital buffer.

### **1.4 Research thesis and hypotheses**

The main thesis of the dissertation is that the aggregation of information from various macroeconomic and financial indicators and the derivation of an aggregate measure of the financial cycle excels the assessment of the credit cycle by using only the deviation of the credit-to-GDP ratio from its long-term trend and can give timely and reliable signals for the accumulation of cyclical risks in the financial system.

The main hypothesis in the study is that there is a relationship and synchronicity between the financial cycle and the business cycle. The accumulation of risks in the financial system and the existence of an inseparable link and synchronization between the two cycles requires the undertaking of timely measures by the central bank aimed at accumulating buffers in the banking system during the upward phase of the cycle to ensure greater stability and resilience of the financial system in the transition from ascending to descending phase of the cycle.

### **1.5 Research methods and approaches**

After a thorough review of the literature on the topic, the questions to which the dissertation seeks answers are explored by applying the following approaches:

- 1) An error correction model is used to study the factors for the dynamics of credit in Bulgaria. This type of models allow to assess the existence of a long-term relationship between the dependent and explanatory variables, to identify the factors influencing short-term fluctuations, as well as to determine how long it takes for the dependent variable to return to its long-term trend.

- 2) Panel regressions with individual banks data and results from the Bank lending survey, conducted by the BNB on a quarterly basis, are used to distinguish between

demand and supply-side factors influencing the credit dynamics. The use of panel regressions based on a balanced or unbalanced data panel is a traditional approach in the literature for the analysis of large data sets, which, in addition to time, also have an individual dimension.

3) To assess the credit cycle in the Bulgarian economy, the Hodrick and Prescott filter (HP filter) is used to measure the deviation of the credit-to-GDP ratio from its long-term trend. The use of the HP filter is enshrined in the recommendations of the European Systemic Risk Board (ESRB) as a key approach in assessing cyclical fluctuations in the financial system and a starting point when taking decisions on the level of the countercyclical capital buffer.

4) To assess the financial cycle in the Bulgarian economy, the Cristiano and Fitzgerald filter (band-pass filter) is used to extract the cyclical components from a wide range of indicators, supplementing the credit-to-GDP ratio and signaling for the accumulation of cyclical systemic risk in the financial system. The cyclical components of the time series are then aggregated to a common financial cycle measure by applying the method of principal components.

5) To assess the business cycle, a structural unobserved components model is applied, based on the use of the maximum likelihood and a Kalman filter to decompose a set of observable variables into trend and cyclical components. Structural unobserved components models combine the advantages of using univariate frequency filters to extract information about the trend and cycle of the observed variables and at the same time allow the imposition of existing theoretical dependencies and structural relationships in the economy. At the same time, they are an alternative and a good approximation of micro-based dynamic stochastic general equilibrium models (DSGE), resembling their logarithmically linearized version.

6) For the analysis of the relationship between the financial cycle and the business cycle, the turning points analysis and synchronization measures are used. The turning points analysis makes it possible to identify the phases, peak and trough of both cycles, as well as to draw conclusions about their length. At the same time, the use of synchronization measures allows conclusions to be drawn about the degree of coherence between the two cycles.

## 1.6 Limitations

The disadvantages of using the Hodrick and Prescott filter are widely discussed in the empirical literature. Although it overcomes some of the shortcomings of the HP filter, the band-pass filter continues to suffer from other of these shortcomings. One of the main limitations when using the band-pass filter is the setting of a predetermined range for the cycle length. When extracting cyclical components from financial variables, the traditional approach in the literature is to use a range between 8 and 30 years. The same range is used in the dissertation, but nevertheless, this shortcoming is still valid.

Another possible limitation of the study is related to the relatively short time

period for which data are available. The occurrence of significant structural changes in the financial system during the study period, especially at its beginning, implies interpretation of the results in terms of the length of the financial cycle with particular caution. The results of the assessment give indications for a single complete cycle in the period under review, respectively the conclusions made about the length and amplitude of cyclical fluctuations in the financial system are based on the parameters of this single cycle. With the accumulation of more observations, it is possible that these estimates will change.

## 1.7 Contributions of the dissertation

The main contributions of the dissertation are mainly of scientifically applied nature and are in the following areas:

- The dissertation makes a thorough review of the literature on the topic of credit and financial cycles, business cycles, the relationship between them and the macroprudential policy.
- An analysis of the banking system developments in the period before and after the global financial and economic crisis is made, emphasizing the role of the BNB in maintaining financial stability.
- Based on an empirical analysis, the factors for the dynamics of credit in Bulgaria are studied, both at the macro level through the use of aggregate macroeconomic indicators and at the micro level through the use of individual data by banks and a distinction is made between demand and supply-side factors.
- The phases of the financial cycle in Bulgaria are assessed by aggregating the information from a wide range of indicators and then the estimated financial cycle in the Bulgarian economy is compared with an estimated business cycle for Bulgaria, derived using an unobserved components model. The main contribution of the dissertation is the derivation of an aggregate measure of the financial cycle. This is one of the first attempts to assess the financial cycle in Bulgaria, exceeding the limitations of the use of the deviation of the credit-to-GDP ratio from its long-term trend.
- Conclusions are made about the length of the financial cycle in Bulgaria, the peak and the trough of the cycle, the current phase of the cycle, as well as the degree of synchronization between the financial cycle and the business cycle. These conclusions would be important in formulating and implementing macroprudential policy measures aimed at limiting the accumulation of cyclical systemic risk in the financial system.
- Based on the results of the empirical analysis, the periods are discussed, in which it is appropriate to apply preventive macroprudential policy measures, such as



decisions on the level of the countercyclical capital buffer. Knowing the phase of the financial cycle in which the economy is at any given point in time is essential for identifying the most appropriate moments for the accumulation or release of buffers, which will make the system more stable and resilient to shocks.

## 1.8 Structure of the dissertation

The dissertation consists of five chapters and is structured as follows:

*Chapter I* provides a thorough review of the literature on the topic and is divided into five parts as follows: The study of the credit and financial cycle and its interaction with the business cycle is based on the fundamental link between credit and economic growth. For this reason, *Part one* of the literature review presents theoretical models for the relationship between credit and economic activity. *Part two* considers empirical studies of the factors influencing the dynamics of credit. In *Part three* a review of the literature and a summary of the approaches used to assess the credit and financial cycle are made. *Part four* provides an overview of the literature and a summary of the approaches used to assess the business cycle. *Part five* considers scientific articles examining the relationship between cyclical fluctuations in the financial system and in the real economy. *Chapter I* ends with a summary and conclusions.

*Chapter II* discusses the dynamics of credit to the private sector, the main developments in the banking system and the policy of the BNB after the introduction of the currency board in Bulgaria. The purpose of this chapter is to set the context in which the main results of the empirical analysis will be presented.

*Chapter III* studies the factors for the dynamics of credit in Bulgaria first at the macro level using aggregate macroeconomic indicators, and then at the micro level using individual banks data and the results from the Bank lending survey. Moreover it tries to make a distinction between factors on the demand and on the supply side of credit.

*Chapter IV* is divided into parts, as follows: *Part one* presents an assessment of the credit cycle in Bulgaria by measuring the deviation of the credit-to-GDP ratio from its long-term trend, as well as an assessment of the financial cycle by aggregating the information from a wide range of macroeconomic and financial indicators. *Part two* presents an assessment of the business cycle in Bulgaria by taking into account the relationship between production, inflation, unemployment and interest rates. *Part three* studies the interaction and the degree of synchronization between the financial cycle and the business cycle.

*Chapter V* discusses the possible application of the results from the estimation of the financial cycle for macroprudential purposes, and in particular for taking decisions on the countercyclical capital buffer rate. The dissertation ends with a summary of the results obtained from the empirical analysis and conclusions.

# Part II

## Description of the dissertation

### Chapter I Literature review

Chapter I provides a thorough review of the literature on credit and financial cycles, their relationship to the business cycle and the macroprudential policy. The most important conclusions from the review of the literature on the topic can be summarized as follows:

- The study of the credit and financial cycle and its relationship with the business cycle is based on the fundamental link between credit and economic growth;
- Beyond the theoretically clear relationship between credit and real economic activity, a wide range of empirical studies try to explain the dynamics of credit with a number of other factors, applying a set of econometric models;
- Special attention in the literature is paid to the differentiated study of factors on the demand and on the supply side of credit, including through the use of data from Bank lending surveys;
- At the heart of the academic literature examining the credit and financial cycle stands the idea that credit expansion is one of the main factors leading to the outbreak of financial crises;
- The terms credit cycle and financial cycle, although widely used in the literature, do not have a generally accepted definition, making it difficult to cut a clear distinction between them. However, the credit cycle is most often related to the deviation of the credit-to-GDP ratio from its long-term trend, while the financial cycle takes into account the cyclical fluctuations in the financial system taking into account a broader set of indicators;
- The lack of a generally accepted definition of the credit and financial cycle makes it difficult to measure them and raises a discussion on the set of indicators to be used for the assessment;
- The academic literature is dominated by the view that the financial cycle is longer than the business cycle and that it is characterized by a significantly

larger amplitude and is closely related to periods of financial crisis that occur near the peak of the financial cycle;

- Widespread in the literature examining the relationship between the financial and business cycle are the ideas that financial crises precede declines in real economic activity, and that periods of financial stress exacerbate the negative effects of the economic downturn;
- The study of the drivers of the financial cycle and the way in which the business cycle and the financial cycle interact is crucial for taking informed decisions when implementing the macroprudential policy measures of the central bank;
- The activation of timely macroprudential policy measures, such as the counter-cyclical capital buffers, can be an effective means of reducing the effects of the accumulation of risks in the financial system;
- The activation of such measures is crucial for the accumulation of buffers during the upward phase of the financial cycle to be released during the downturn, which will make the system more resilient and able to respond to shocks.

## **Chapter II Banking system developments, the credit activity in Bulgaria and the BNB policy after the introduction of the currency board**

This chapter provides a brief overview of the developments in the banking system and in the lending activity in Bulgaria before, during and after the global financial and economic crisis, as well as a description of the BNB policy in the period after the introduction of the currency board. The purpose of this chapter is to set the context in which the main results of the empirical analysis will be presented.

### **2.1 Banking system developments and the credit activity in Bulgaria in the period 1998 - 2008**

After several unsuccessful attempts to stabilize the Bulgarian economy in the period 1991-1996 and a deep financial crisis, culminating in a short episode of hyperinflation in late 1996 and early 1997, with a new law on the Bulgarian National Bank on June 10, 1997, a currency board was introduced in Bulgaria. In the first few years after the introduction of the currency board, credit to the private sector in Bulgaria grew at a slow pace, and the credit-to-GDP ratio averaged 11% for the period 1998-2001. At that time, the banking system in Bulgaria was characterized by predominantly state ownership, a legacy of high levels of non-performing loans, low capitalization and liquidity constraints. The forthcoming privatization of state-owned banks during

this period and the undertaken in this regard clearing of inherited portfolios of non-performing loans, as well as the lack of expertise in the application of modern banking practices were structural factors hindering credit expansion. Meanwhile, privatization was an important factor that marked the beginning of a gradual process of restructuring in the banking sector.

Since the beginning of 2002 there had been a gradual acceleration of credit growth and the credit-to-GDP ratio reached nearly 70 % at the end of 2008. The rapid credit growth in these years was due on the one hand to the high demand for loans, stimulated by the favorable internal and external macroeconomic environment, the upward phase of the credit cycle on a global scale, the high expected return on investment and the positive expectations for income convergence. On the other hand, banks were also actively expanding their lending activities. An important factor for the deepening of financial intermediation during this period was the privatization of many local banks by foreign financial institutions. Another factor stimulating credit growth was the signing of the Treaty of Accession of Bulgaria to the European Union in 2005, which had a positive effect on investors' attitudes to the country's future prospects.

In this context, operating in a currency board arrangement characterized by the absence of monetary policy, the Bulgarian National Bank pursued a consistent countercyclical policy, using macroprudential and supervisory measures aimed at ensuring stability of the banking system and limiting rapid credit growth. In the years before 2008, the BNB imposed strict and conservative regulations on capital adequacy, liquidity, risk classification and banks' provisions. Some of the macroprudential measures were aimed at pursuing a more restrictive policy regarding the issuance of banking licenses, expanding the deposit base on which the minimum required reserves of banks are accrued, as well as tightening the supervision of banks through the application of various supervisory policies.

In April 2005 the BNB introduced administrative credit restrictions (credit ceilings), which were in force until January 2007. In the period after the introduction of the credit ceilings, there was a significant improvement in banks' balance sheets and a reduction in credit risk in the banking system, as well as a deceleration of private sector credit growth. After the termination of the credit ceilings at the beginning of 2007, credit growth began to accelerate again, reaching 62.5% at the end of the year. Continuing to pursue a countercyclical policy, in September 2007 the BNB increased the minimum reserve requirements for banks from 8% to 12%.

## **2.2 Banking system developments and the credit activity in Bulgaria in the period after the global financial and economic crisis**

After the onset of the global financial and economic crisis, the behavior of banks changed significantly. Parent banks began to limit the funds provided to their local branches and affiliates. At the same time, banks in Bulgaria started tightening their

credit standards and relying mainly on local deposit resources to finance their activities. Since the end of 2008, lending to the private sector had slowed significantly, reflecting the intensification of the global financial and economic crisis. Despite the lack of exposure of Bulgarian banks to asset-backed securities, the crisis affected Bulgaria indirectly through increased uncertainty in international financial markets, lower inflows of foreign capital and declining external demand.

In the period of declining economic activity, the BNB continued to pursue a counter-cyclical policy, taking a number of measures in late 2008 and early 2009 to provide more flexibility to commercial banks in managing their liquid resources by using capital buffers accumulated during the period of economic growth. Some of these measures were related to easing the requirements for maintaining minimum required reserves with the BNB and included the recognition of a reserve asset of 50 % of cash in banks, as well as a reduction of the required minimum reserves (MRR) from 12% to 10%. These measures were followed by a further reduction of the requirements for maintaining minimum reserves. The rate of the minimum reserve requirement was reduced to 5% for funds attracted from non-residents and to 0% for government deposits secured by government securities. Since the beginning of 2009, the average effective rate of required minimum reserves for the banking system had fallen to about 7%, and the overall effect of the BNB measures was the release of significant liquidity in the banking sector.

Other measures taken by the BNB in response to the crisis were related to easing the requirements for credit classification and provisioning, with the aim of facilitating credit institutions in negotiating loan terms and achieving greater similarity with international practices. This created more favorable conditions for banks, giving them more flexibility in negotiating terms with customers who were experiencing temporary difficulties as a result of the deteriorating macroeconomic environment.

After the period of decline in real GDP, which lasted until the first quarter of 2010, the Bulgarian economy began to recover slowly. However, the period 2010-2014 was characterized by subdued private sector credit growth due to increased uncertainty about the speed of macroeconomic recovery, prudent behavior and limited credit demand from firms and households, and the relatively tight lending policy of banks. During this period the BNB continued its countercyclical policy, keeping the minimum reserve requirement unchanged at 10% for deposits attracted from residents, 5% for funds attracted from non-residents and 0% for government deposits secured by government securities. The macroprudential measures of the BNB in this period were related to the introduction of the new European requirements for the capital adequacy of banks.

In 2014, the BNB Governing Council introduced a new Ordinance on Banks' Capital Buffers. With this Ordinance regulatory requirements related to the establishment of a methodology for maintaining a capital conservation buffer, a bank-specific counter-cyclical capital buffer, a buffer for global systemically important institutions, a buffer for other systemically important institutions and a systemic risk buffer were

introduced. A bank that does not meet the required levels of capital buffers is subject to restrictions on the payment of dividends, variable remuneration and payments on other Tier I instruments. Capital buffers are maintained in addition to meeting the core capital requirements of Regulation (EU) № 575/2013 and ensure that banks accumulate a sufficient capital base during periods of economic growth to cover potential losses during periods of decline in real economic activity.

At the end of June 2014, the Bulgarian banking system was subjected to liquidity pressure, which led to the closure of two Bulgarian banks - Corporate Commercial Bank and Commercial Bank Victoria. However, the liquidity buffers required by the BNB and maintained by banks, as well as the measures taken to maintain the stability of the banking system, contributed very quickly to restoring confidence. Liquidity pressures were limited and did not spread to the banking system as a whole. In November 2014, the license of Corporate Commercial Bank was revoked and the bank was excluded as a reporting unit from the monetary statistics. This was reflected in a significant reduction in credit to the non-government sector, which annual growth rates became negative. The negative credit dynamics was maintained until the end of 2015, when the base effect of the exclusion of Corporate Commercial Bank from the monetary statistics was exhausted.

In 2016, the BNB conducted an asset quality review and a stress test of the Bulgarian banking system. The purpose of the stress test was to assess the ability of banks to respond to shocks arising from potential negative financial and macroeconomic developments. The results of the asset quality review showed that capital adequacy at the system level remained above the required regulatory minimum. The results of the stress test in two macroeconomic scenarios - baseline and adverse, also indicated the strong capital position of banks and their ability to absorb shocks, although there was some variation in banks' performance. In connection with the process of reviewing the quality of assets and the stress test of the Bulgarian banking system, in 2015 and 2016 banks took measures to optimize their loan portfolios by writing-off and selling non-performing loans. These measures, in addition to the reluctance of firms and households to take new loans in the still uncertain economic environment and the prudent credit policy of banks, were the factors that determined the low lending activity during this period.

From the end of 2016 and the beginning of 2017, a gradual recovery of lending to the private sector was observed. These developments reflected the general improvement of the macroeconomic environment in the context of declining interest rates on loans. The downward trend in interest rates observed since 2014 reflected on the one hand the increasing volume and declining cost of attracted funds and the high liquidity in the Bulgarian banking system, and on the other hand the further easing of the ECB monetary policy and the introduction of negative interest rates on the deposit facility.

In 2018 and 2019, the dynamics of credit to the private sector was upward, with accelerating credit growth rates in both the household and the non-financial corporations sectors. The favorable macroeconomic environment, the growing domestic demand and

the declining interest rates on loans, which by the end of 2019 reached their historically lowest levels, contributed to this dynamics. The trends in loan interest rates were determined by the strong competition in the banking sector, the low cost and the growing volume of attracted funds, as well as by the reduced risk assessment of banks.

Based on the observed favorable trends in the economic environment and the intensified lending activity in the period after 2017, as well as on an analysis of additional indicators for the accumulation of cyclical systemic risk in the banking system, it was estimated that the country was entering the ascending phase of the economic and financial cycle. Taking into account these factors, on September 25, 2018 the Governing Council of the BNB increased the level of the countercyclical capital buffer applicable to credit risk exposures in the Republic of Bulgaria from 0% to 0.5% effective from October 1, 2019. The increase of the countercyclical buffer aims at using the favorable economic conditions to maintain and further strengthen the capital position of the banking system, thereby increasing the resilience of credit institutions to future realization of credit risk.

As a result of the BNB's consistent countercyclical policy, by the end of 2019 the banking sector in Bulgaria was characterized by very good general performance and positive development trends - high capital adequacy and liquidity, improving asset quality and historically the highest annual profit for the banking system.

## **Chapter III An empirical analysis of the factors for credit growth in Bulgaria**

In accordance with the goals and objectives of the dissertation, this chapter presents an analysis of the factors influencing the dynamics of credit in Bulgaria. In the first part of the chapter the analysis focuses on the factors for credit growth at the macro level, using aggregate indicators for the economy. The second part makes an attempt to distinguish between credit demand and credit supply factors, based on the use of the results from the Banking lending survey. In the third part, the analysis is deepened using individual banks data on the amount of loans granted, which are linked to the individual responses of the banks to the Bank lending survey.

### **3.1 Empirical analysis of the factors for the dynamics of credit at the macro level**

The first part of Chapter III provides an analysis of the factors influencing the growth of credit to the private sector in Bulgaria at the macro level. The analysis is based on the use of the following set of variables: claims on the non-government sector (CR\_T), growth of real seasonally adjusted GDP (GDP\_sa), harmonized seasonally adjusted consumer price index (HICP\_sa), the ratio of non-performing loans to total private sector loans (NPL\_T), the capital to assets ratio in the banking system (C\_A), external debt in the form of foreign direct investment (ED\_FDI) and the spread

between interest rates on loans and deposits (LIR\_DIR). The data covers the period Q1 1999 - Q4 2019.

An error-correction model is used to assess the impact of the above variables on credit growth. These type of models are used to estimate a long-term and a short-term relationship between the dependent variable and a set of explanatory variables, with the aim of finding a cointegration relationship that sets the long-term equilibrium. In turn, the short-run equation determines the deviations from the long-run equilibrium and the factors that influence them and also shows the speed at which the dependent variable returns to its long-term trend. To justify the use of an error correction model, the variables used in the regression analysis must be integrated in the first order and there must be a cointegration relationship between them.

Based on tests performed for the presence of unit roots and for cointegration, it can be concluded that all variables used in the empirical analysis are I(1) and that there is a cointegration relationship between the variables, i.e. they have a common long-term stochastic trend. As a result the use of an error-correction model is justified.

The model used for the econometric analysis has the following form:

Long-run relationship:

$$\begin{aligned} \log(CR\_T\_STAR_t) = & \beta_0 + \beta_1 \log(GDP\_sa_t) + \beta_2 \log(HICP\_sa_t) \\ & + \beta_3 \log(ED\_FDI_t) + \beta_4 (NPL\_T_t) + \beta_5 dummy2005Q1 \end{aligned} \quad (1)$$

Short-run relationship:

$$\begin{aligned} \Delta \log(CR\_T_t) = & \beta_0 [\log(CR\_T_{t-1}) - \log(CR\_T\_STAR_{t-1})] + \beta_1 \Delta \log(GDP\_sa_t) \\ & + \beta_2 \Delta \log(ED\_FDI_t) + \beta_3 d(C\_A_t) + \beta_4 dummy2005Q1 + \beta_5 dummy2005Q2 \\ & + \beta_6 dummy2014Q4 + \beta_7 d(LIR\_DIR_t) + \beta_8 \Delta \log(CR\_T_{t-1}) \end{aligned} \quad (2)$$

where,  $\log(CR\_T\_STAR_t)$  is the long-term equilibrium level of credit to the private sector and  $\log(CR\_T_{t-1}) - \log(CR\_T\_STAR_{t-1})$  is an error correction term that shows the extent to which the short-term credit dynamics is affected by deviations from the long-term equilibrium. The inclusion of dummy variables is aimed at taking into account structural changes in the data, related to the introduction of the credit ceilings in 2005 and to the exclusion of Corporate Commercial Bank from the monetary statistics at the end of 2014.

The results of the empirical analysis are presented in Tables 1 and 2. Table 1 shows the factors influencing the credit dynamics in the long run and Table 2 the factors determining credit growth in the short run respectively.



Table 1 Factors for the dynamics of credit in the long run

Explanatory Variables	Dependent Variable: log(CR_T)
Constant	-8.39*** (1.06)
log(GDP_sa)	0.56*** (0.15)
log(HICP_sa)	2.16*** (0.28)
log(NPL_T)	-0.10*** (0.01)
log(ED_FDI)	0.35*** (0.04)
D_2005Q1	0.29*** (0.07)
R <sup>2</sup>	0.99
S.E. of regression	0.07

The results of the econometric analysis show that all coefficients in front of the explanatory variables in the long-run equation are statistically significant and have the expected sign. Real GDP growth, higher inflation and higher foreign direct investment in the country have a positive impact on credit dynamics. At the same time, the larger share of non-performing loans in banks' loan portfolios, as might be expected, has a restrictive effect on lending activity.

Table 2 Factors for the dynamics of credit in the short run

Explanatory Variables	Dependent Variable: $\Delta\log(\text{CR}_T)$
Error correction term	-0.10** (0.04)
$\Delta\log(\text{GDP}_{sa})$	1.61*** (0.34)
$\Delta\log(\text{ED\_FDI})$	0.16*** (0.04)
d(C_A)	-0.01** (0.00)
D_2005Q1	0.15*** (0.02)
D_2005Q2	-0.23*** (0.03)
D_2014Q4	-0.11*** (0.02)
$\Delta\log(\text{CR}_T(-1))$	0.47*** (0.06)
d(LIR_DIR)	-0.01 (0.00)
R <sup>2</sup>	0.84
S.E. of regression	0.02
DW Statistics	2.18
LM Test	0.36
Jarque-Bera Test	0.14
Breusch-Pagan-Godfrey Test	0.10

In the short run, the dynamics of credit is significantly and positively influenced by real GDP growth, the higher amount of foreign direct investment in the country

and the credit activity in the previous period, the most significant being the impact of real economic activity. According to the results of the empirical analysis, the change in the interest rate spread does not have a statistically significant effect on credit growth for the private sector. At the same time, the coefficient in front of the error correction term is significant and is estimated at -0.10, which means that the dependent variable returns to its equilibrium level for a period of approximately ten quarters.

### 3.2 Distinction between credit demand and credit supply factors

For the distinction between demand and supply factors for the dynamics of credit to the private sector, the results from the Bank lending survey are used. The survey has been conducted on a quarterly basis by the BNB since the end of 2003. In its current version the survey consists of 20 questions and includes two sections. The first section regards lending to corporations and the second lending to households. The survey includes questions concerning the changes in the demand for loans and in the credit policy of banks during the past quarter, questions regarding the factors that determine these changes, as well as questions concerning banks' expectations for the next quarter. The net balance of opinions regarding the demand for loans and the credit standards applied by banks can be used as an indicator of the changes in the demand and, respectively, in the supply of credit. Questions concerning changes in demand and credit standards for total corporate loans as well as for household loans have been included in the survey since early 2010. At the same time, questions regarding banking standards and demand for short-term and long-term loans for enterprises are available in the survey from the beginning of its implementation, i.e. from the fourth quarter of 2003. In this regard, in order to use as long time series of data as possible, the analysis in this part of the dissertation is focused on the factors influencing the dynamics of corporate lending, distinguishing between short-term and long-term corporate loans.

The equations for short-term and long-term loans are identical, regressing the growth of claims on non-financial corporations on the net balance of opinions on the questions regarding changes in demand for loans and in credit standards.

Short-term loans for enterprises:

$$\Delta \log(CR\_E_t) = \beta_0 + \beta_1 \Delta D\_E\_St_t + \beta_2 \Delta S\_E\_St_t + \epsilon_t \quad (3)$$

Long-term loans for enterprises:

$$\Delta \log(CR\_E_t) = \beta_0 + \beta_1 \Delta D\_E\_Lt_t + \beta_2 \Delta S\_E\_Lt_t + \epsilon_t \quad (4)$$

where the dependant variable  $\Delta \log(CR\_E)$  is the growth of claims on non-financial corporations,  $\Delta D\_E\_St$  and  $\Delta S\_E\_St$  are the net balances of opinions regarding changes in demand and credit standards concerning short-term loans to enterprises, while  $\Delta D\_E\_Lt$  and  $\Delta S\_E\_Lt$  are the net balances of opinions regarding changes in demand and credit standards concerning long-term loans to enterprises

Initially, the equations are estimated to include only the variables for credit demand and credit standards from the survey. To test the stability of the estimates obtained, in the two specifications successively are included additional explanatory variables such as real seasonally adjusted GDP growth ( $\Delta \log GDP_{sa}$ ), an interest rate spread defined as the difference between the weighted average interest rates on loans and deposits of non-financial corporations ( $LIRC\_DIRC$ ), the share of non-performing loans in banks' portfolios ( $NPL\_T$ ) and the capital to assets ratio in the banking system ( $C\_A$ ).

Table 3 Factors for the growth of credit to enterprises; short-term loans

Explanatory Variables	Dependent Variable: $\Delta \log(CR\_E)$	Dependent Variable: $\Delta \log(CR\_E)$	Dependent Variable: $\Delta \log(CR\_E)$	Dependent Variable: $\Delta \log(CR\_E)$	Dependent Variable: $\Delta \log(CR\_E)$
Constant	-0.01 (0.01)	-0.01 (0.00)	-0.01* (0.00)	-0.01* (0.00)	-0.01* (0.00)
D_E_St	0.09*** (0.01)	0.07*** (0.01)	0.07*** (0.01)	0.07*** (0.02)	0.06*** (0.02)
S_E_St	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
D_2005Q1	0.18*** (0.02)	0.18*** (0.02)	0.18*** (0.02)	0.18*** (0.02)	0.17*** (0.02)
D_2005Q2	-0.26*** (0.03)	-0.27*** (0.03)	-0.28*** (0.03)	-0.28*** (0.03)	-0.27*** (0.03)
D_2014Q4	-0.15*** (0.02)	-0.16*** (0.02)	-0.15*** (0.02)	-0.15*** (0.02)	-0.16*** (0.02)
$\Delta \log(CR\_E(-1))$	0.34*** (0.07)	0.33*** (0.07)	0.35*** (0.07)	0.35*** (0.07)	0.35*** (0.07)
$\Delta \log(GDP_{sa})$		1.06*** (0.39)	1.30*** (0.43)	1.27*** (0.44)	1.21*** (0.44)
$\Delta NPL\_T$			0.01 (0.00)	0.01 (0.00)	0.01 (0.00)
$\Delta LIRC\_DIRC$				0.00 (0.00)	0.00 (0.00)
$\Delta C\_A$					-0.01 (0.01)
R <sup>2</sup>	0.86	0.87	0.88	0.88	0.88
S.E. of regression	0.02	0.02	0.02	0.02	0.02
DW Statistics	1.90	1.70	1.64	1.66	1.66
LM Test	0.95	0.70	0.57	0.56	0.63
Jarque-Bera Test	0.42	0.77	0.68	0.72	0.71
Breusch-Pagan-Godfrey Test	0.01	0.11	0.14	0.08	0.01

The results for both short-term and long-term corporate loans show that the variable characterizing credit demand is statistically significant in all specifications and the coefficient in front of it remains stable when additional control variables are included. According to the results of the empirical analysis, the changes in credit standards do not have a statistically significant effect on the dynamics of corporate lending. Among the additional explanatory variables included in the analysis, statistical significance is found only in terms of real economic activity (See Table 3 and Table 4).

Table 4 Factors for the growth of credit to enterprises; long-term loans

Explanatory Variables	Dependent Variable: $\Delta\log(\text{CR}_E)$	Dependent Variable: $\Delta\log(\text{CR}_E)$	Dependent Variable: $\Delta\log(\text{CR}_E)$	Dependent Variable: $\Delta\log(\text{CR}_E)$	Dependent Variable: $\Delta\log(\text{CR}_E)$
Constant	-0.01 (0.00)	-0.01 (0.00)	-0.01** (0.00)	-0.01** (0.00)	-0.01 (0.01)
D_E_Lt	0.09*** (0.01)	0.07*** (0.01)	0.07*** (0.01)	0.07*** (0.01)	0.07*** (0.01)
S_E_Lt	0.02 (0.01)	0.02 (0.01)	0.01 (0.01)	0.01 (0.01)	0.02 (0.01)
D_2005Q1	0.17*** (0.02)	0.17*** (0.02)	0.17*** (0.02)	0.17*** (0.02)	0.16*** (0.02)
D_2005Q2	-0.26*** (0.03)	-0.26*** (0.03)	-0.27*** (0.03)	-0.28*** (0.03)	-0.27*** (0.03)
D_2014Q4	-0.15*** (0.02)	-0.15*** (0.02)	-0.14*** (0.02)	-0.14*** (0.02)	-0.15*** (0.02)
$\Delta\log(\text{CR}_E(-1))$	0.29*** (0.07)	0.28*** (0.06)	0.31*** (0.06)	0.31*** (0.06)	0.30*** (0.06)
$\Delta\log(\text{GDP}_{sa})$		0.88** (0.37)	1.16*** (0.37)	1.16*** (0.38)	0.88*** (0.37)
$\Delta\text{NPL}_T$			0.01** (0.00)	0.01** (0.00)	0.01* (0.00)
$\Delta\text{LIRC}_{\text{DIRC}}$				0.00 (0.00)	0.00 (0.00)
$\Delta C_A$					-0.01 (0.00)
$R^2$	0.88	0.89	0.90	0.90	0.90
S.E. of regression	0.02	0.02	0.02	0.02	0.02
DW Statistics	2.02	1.78	1.85	1.85	1.75
LM Test	0.83	0.41	0.42	0.43	0.37
Jarque-Bera Test	0.45	0.62	0.94	0.94	0.49
Breusch-Pagan-Godfrey Test	0.05	0.05	0.08	0.03	0.01

### 3.3 Factors for the dynamics of credit at the micro level

In this part of the dissertation, the analysis at the macro level is supplemented by a more in-depth study of the factors for credit growth at the micro level. For this purpose, individual data by banks are used, as well as individual results from the Bank lending survey. A panel approach is used for the purposes of the empirical analysis, whereas the individual banks' responses to the questions from the survey are related to data on the amount of loans granted by the respective banks. In addition to the results of the survey, additional explanatory variables are included in the panel. These include specific indicators for each individual bank, such as the spread between interest rates on corporate loans and deposits by individual bank ( $\text{IRS}$ ) and the capital to assets ratio for each individual bank ( $C_A$ ), as well as variables that are common to all banks, such as real GDP growth ( $\Delta\log\text{GDP}_{sa}$ ), the business climate in Bulgaria ( $\text{BC}$ ) and the share of non-performing loans in total loans to the private sector ( $\text{NPL}$ ). The econometric analysis is performed for an unbalanced data panel, covering the period 2003 Q4 - 2019 Q4, applying panel estimation with cross section fixed effects to account for the unobserved variation among banks.

The estimated equations have the following form:

Short-term loans to enterprises:

$$\begin{aligned} \Delta \log(CR_{E_{i,t}}) = & \alpha_i + \beta_1(L) \text{Demand\_decreased\_ST}_{i,t} + \\ & \beta_2(L) \text{Demand\_increased\_ST}_{i,t} + \beta_3(L) \text{Standards\_tightened\_ST}_{i,t} + \\ & \beta_4(L) \text{Standards\_eased\_ST}_{i,t} + \gamma(L) X_{i,t} + \epsilon_{i,t} \quad (5) \end{aligned}$$

Long-term loans to enterprises:

$$\begin{aligned} \Delta \log(CR_{E_{i,t}}) = & \alpha_i + \beta_1(L) \text{Demand\_decreased\_LT}_{i,t} + \\ & \beta_2(L) \text{Demand\_increased\_LT}_{i,t} + \beta_3(L) \text{Standards\_tightened\_LT}_{i,t} + \\ & \beta_4(L) \text{Standards\_eased\_LT}_{i,t} + \gamma(L) X_{i,t} + \epsilon_{i,t} \quad (6) \end{aligned}$$

As the information from the survey is of a qualitative nature, the indicators characterizing the demand and supply of loans are included in the specifications as dummy variables. With regard to credit demand and credit standards, two pairs of variables are constructed, namely for a decrease or an increase in loan demand and for tightening or easing of credit standards. This is done separately for the supply and demand of short-term and long-term loans to enterprises. For example, the variable "demand decreased" takes the value 1 if bank  $i$  has reported a decrease in demand for loans in period  $t$  and 0 otherwise. The variable "standards tightened" takes the value 1 if bank  $i$  has reported a tightening of credit standards in period  $t$  and 0 otherwise. The variables "demand increased" and "standards eased" are compiled in a similar way. The vector  $X$  includes the additional macro and micro control variables.

Six alternative specifications are estimated. First, only the impact of the variables from the Bank lending survey, reflecting the changes in credit demand and credit standards, is assessed, and subsequently the additional macro and micro control variables are included one by one. This is done separately for short-term and long-term corporate loans (See Table 5 and Table 6).

Table 5 Factors for the growth of credit to enterprises at the micro level; short-term loans

Explanatory Variables	Dependent Variable: $\Delta\log(\text{CR}_E)$					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.02*** (0.01)	-0.01 (0.01)	-0.03* (0.02)	-0.03* (0.01)	-0.03** (0.02)	-0.03** (0.02)
$\Delta\text{Credit demand}_{ST}(-1)$ (decrease)	-0.07*** (0.02)	-0.07*** (0.02)	-0.07*** (0.02)	-0.07*** (0.02)	-0.06*** (0.02)	-0.06*** (0.02)
$\Delta\text{Credit demand}_{ST}(-1)$ (increase)	0.03*** (0.01)	0.03*** (0.01)	0.03*** (0.01)	0.02** (0.01)	0.02** (0.01)	0.02** (0.01)
$\Delta\text{Credit standards}_{ST}(-1)$ (tightening)	0.00 (0.01)	0.02 (0.01)	0.01 (0.02)	0.01 (0.01)	0.02 (0.01)	0.02 (0.01)
$\Delta\text{Credit standards}_{ST}(-1)$ (easing)	0.05** (0.02)	0.05** (0.02)	0.05** (0.02)	0.05** (0.02)	0.05** (0.02)	0.06** (0.02)
$\Delta\log(\text{GDP}_{sa})$		3.04*** (0.57)	2.88*** (0.57)	3.14*** (0.57)	2.75*** (0.58)	2.12*** (0.63)
IRS			0.60** (0.31)	0.60** (0.31)	0.74** (0.31)	0.86*** (0.31)
$\Delta\text{C}_A$				1.05*** (0.19)	1.03*** (0.19)	1.05*** (0.19)
$\Delta\text{NPL}(-1)$					-1.90*** (0.65)	-2.06*** (0.66)
$\Delta\text{BC}$						0.01*** (0.00)
$\Delta\log(\text{CR}_E(-1))$	-0.30*** (0.03)	-0.31*** (0.03)	-0.31*** (0.03)	-0.31*** (0.03)	-0.31*** (0.03)	-0.32*** (0.03)
Periods	63	63	63	63	63	63
Cross sections	39	39	39	39	39	39
Number of observations	1520	1520	1520	1520	1520	1520
$R^2$	0.11	0.13	0.13	0.15	0.15	0.16
DW Statistics	1.99	2.02	2.02	1.99	1.99	1.98

The results of the econometric analysis for both short-term and long-term corporate loans show that the coefficients in front of the constructed variables for a decrease and an increase in demand and for easing of credit standards have the expected signs and are stable and statistically significant in all specifications. A decrease in demand has a negative effect on credit growth, respectively an increase in demand or a loosening of credit standards has a positive effect on the growth of loans to corporations. The estimated coefficients in front of the additional control variables are also highly statistically significant in all specifications and have the expected signs: positive for real GDP growth, the business climate and banks' individual interest rate spreads and capital to assets ratios and negative for the share of non-performing loans in banks' portfolios.

Table 6 Factors for the growth of credit to enterprises at the micro level; long-term loans

Explanatory Variables	Dependent Variable: $\Delta\log(\text{CR\_E})$					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.01** (0.01)	-0.01 (0.01)	-0.03** (0.02)	-0.03* (0.01)	-0.03* (0.02)	-0.03* (0.01)
$\Delta\text{Credit demand\_LT} (-1)$ (decrease)	-0.04** (0.02)	-0.03* (0.01)	-0.03* (0.01)	-0.03* (0.01)	-0.03 (0.01)	-0.03 (0.01)
$\Delta\text{Credit demand\_LT} (-1)$ (increase)	0.04*** (0.01)	0.03*** (0.01)	0.03*** (0.01)	0.03*** (0.01)	0.03*** (0.01)	0.03*** (0.01)
$\Delta\text{Credit standards\_LT} (-1)$ (tightening)	0.02 (0.01)	0.03** (0.01)	0.03* (0.01)	0.03* (0.01)	0.03** (0.01)	0.03** (0.01)
$\Delta\text{Credit standards\_LT} (-1)$ (easing)	0.05** (0.03)	0.04* (0.02)	0.04* (0.02)	0.05* (0.02)	0.05** (0.02)	0.05** (0.02)
$\Delta\log(\text{GDP\_sa})$		2.93*** (0.57)	2.81*** (0.57)	3.13*** (0.57)	2.74*** (0.58)	2.01*** (0.63)
IRS			0.54* (0.32)	0.45* (0.31)	0.59* (0.32)	0.71** (0.32)
C_A				1.17*** (0.22)	1.14*** (0.21)	1.17*** (0.22)
$\Delta\text{NPL} (-1)$					-1.86*** (0.66)	-2.03*** (0.66)
$\Delta\text{BC}$						0.01*** (0.00)
$\Delta\log(\text{CR\_E}(-1))$	-0.30*** (0.03)	-0.31*** (0.03)	-0.31*** (0.03)	-0.31*** (0.03)	-0.31*** (0.03)	-0.32*** (0.03)
Periods	63	63	63	63	63	63
Cross sections	39	39	39	39	39	39
Number of observations	1520	1520	1520	1520	1520	1520
$R^2$	0.11	0.13	0.13	0.15	0.15	0.16
DW Statistics	2.00	2.02	2.02	1.98	1.99	1.97

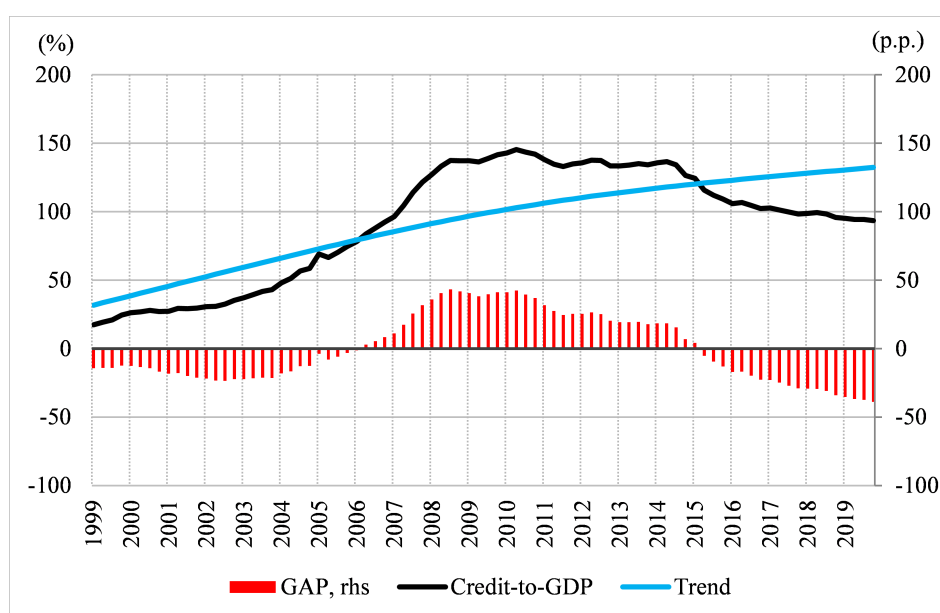
## Chapter IV The credit and financial cycle in Bulgaria and its interaction with the business cycle

### 4.1 Assessment of the credit and financial cycle in the Bulgarian economy using frequency filters and the principal components analysis

After studying the factors for the dynamics of credit in Bulgaria, the aim of the fourth chapter of the dissertation is to deepen the analysis by constructing an aggregate measure of the financial cycle in the Bulgarian economy. From the review of the literature on credit and financial cycles it can be concluded that most often the deviation of the credit-to-GDP ratio from its long-term trend is used to measure cyclical fluctuations in the financial system. A similar approach is adopted by the European Systemic Risk Board (ESRB), which uses this indicator as a reference indicator and a starting point when taking decisions on the countercyclical capital buffer rate. However, in the academic literature it is proven empirically that in many cases the use of this indicator alone provides relatively limited information on the cyclical fluctuations in the financial system and thus the use of a wider range of financial and macroeconomic indicators is recommended.

For the assessment of the deviation of the credit-to-GDP ratio from its long-term trend, the methodology set out in the ESRB recommendations is applied using a Hodrick and Prescott filter with a lambda parameter of 400 000. Based only on the information that provides the deviation of the above ratio from its trend, it can be concluded that in the period 2015 - 2019 there is no evidence for an accumulation of cyclical systemic risk in the economy (see Figure 1). The increase in the negative value of this deviation (from -5.2 percentage points in the second quarter of 2015 to -38.8 percentage points at the end of 2019) also gives grounds to assume that the reversal of this trend and the closing of the negative deviation would take at least several years. From a macroprudential point of view, the presence of a negative deviation of the credit-to-GDP ratio from the long-term trend is a precondition for applying a countercyclical capital buffer rate of 0 %.

Figure 1 Deviation of the credit-to-GDP ratio from its long-term trend



The data show that the analyzed period is characterized by significant amplitudes in the dynamics of the indicators. The beginning of the period was marked by fundamental structural changes in the financial system. In 1999, the financial system was still experiencing the momentum of the deep economic crisis in Bulgaria from 1996 - 1997, which led to hyperinflation, the closure of nearly a third of the country's banks and devaluation of savings. The privatization of the state-owned banks, which dominated the banking system, as well as of the state-owned enterprises was forthcoming. In this period there was no external lending and investment activity was at a very low level. All this was reflected in low demand for loans and at the beginning of the studied period the credit-to-GDP ratio was very low. For the most part, the privatization process was completed by the end of 2001, and in the period 2001-2008 credit growth significantly exceeded GDP growth, leading to a sharp increase in the credit-to-GDP ratio. The only exception was the period in which the credit ceilings administratively imposed by the BNB were into force - 2005 - 2006. The exclusion of Corporate Commercial Bank from the scope of the monetary statistics at the end of 2014 had a significant



impact on the dynamics of credit to the private sector, which until the exhaustion of the base effect of the exclusion of CCB was negative. This was reflected in a decrease in the credit-to-GDP ratio and a negative deviation from the trend in 2015. The moderate growth rates of credit in the period 2016-2019 cannot be compared with the double-digit growth rates for the period 2001-2008 and as a result the application of the Hodrick and Prescott filter with a high smoothing parameter leads to a negative deviation from the long-term average.

In order to aggregate the information from a broader set of indicators, not limited to the credit-to-GDP ratio, the following analysis presents an assessment of the financial cycle in the Bulgarian economy. Following the literature on financial cycles and the ESRB's recommendations on the indicators that can complement the deviation of the credit-to-GDP ratio from its long-term trend and signal the potential accumulation of cyclical risk in the economy, the assessment of the financial cycle is based on aggregation of information from the cyclical components of the following set of indicators:

1) Indicators of credit developments and private sector debt burden. Excessive growth of lending to firms and households and, respectively, high private sector indebtedness create risks of inability to repay the debt obligations in the downside phase of the business cycle.

2) Indicators of potential overvaluation of property prices. The rapid rise in real estate prices is one of the factors considered in the literature to accompany and accelerate the onset of financial crises. During the upward phase of the cycle, the availability of cheap financing can lead to an increase in demand and prices above a sustainable level, which can stimulate further credit expansion as a result of the wealth effect and the increase in the value of collateral.

3) Indicators of external imbalances. High and persistent current account deficits are usually associated with excessive accumulation of external debt, financing overheating of the economy.

4) Interest rate spreads. In the ascending phase of the business cycle, the favorable macroeconomic environment, the positive attitudes of economic agents and the growing revenues and profits contribute to a decreasing perception of risk, which leads to a narrowing of interest rate spreads. At the same time, the reduced risk assessment may stimulate the financing of riskier projects, which can turn out to be unprofitable and generate losses for creditors when the cycle phase is reversed.

5) Indicators of the strength of banks' balance sheets. The low level of capital adequacy and the high ratio of loans to deposits reduce the ability of banks to respond to shocks.

The individual indicators used to obtain a measure of the financial cycle are presented in Table 7.

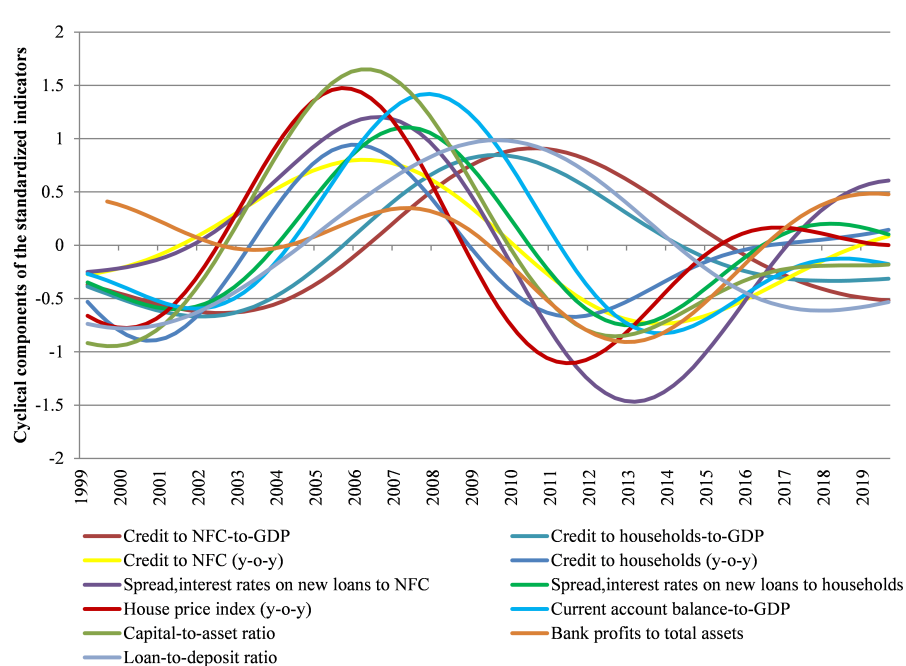
Table 7 Indicators used to assess the financial cycle in Bulgaria

Groups of indicators	Indicators	Notation	Source
Indicators of credit developments and private sector debt burden	Credit to NFC-to-GDP (domestic credit+external debt)	CR_GDP_NFC	BNB: Monetary statistics, Gross external debt; NSI
	Credit to households-to-GDP	CR_GDP_H	BNB: Monetary statistics NSI
	Credit to NFC (annual growth rate)	CR_NFC_Y	BNB: Monetary statistics
	Credit to households (annual growth rate)	CR_H_Y	BNB: Monetary statistics
Indicators of potential overvaluation of property prices	House price index (annual growth rate)	HPI_Y	NSI
Indicators of external imbalances	Current account balance-to-GDP	CA_GDP	BNB: Balance of payments NSI
Interest rate spreads	Spread between interest rates on new loans to NFC and 3-Month EURIBOR	LIRC_EUR	BNB: Interest rate statistics; ECB
	Spread between interest rates on new loans to households and 3-Month EURIBOR	LIRH_EUR	BNB: Interest rate statistics; ECB
Indicators of the strength of banks' balance sheets	Capital-to-asset ratio (leverage)	C_A	BNB: Banking supervision
	Bank profits to total assets	P_A	BNB: Banking supervision
	Loan-to-deposit ratio	L_D	BNB: Banking supervision

All indicators used to estimate the financial cycle are standardized to ensure comparability of their units, which is a standard approach in the financial cycle literature. In addition to standardization, some of the indicators are multiplied by a factor of -1, so that any increase in the respective indicator is indicative of potential accumulation of cyclical risk in the financial system and respectively any decrease is indicative of risk reduction or materialization.

Following the indicator standardization procedure, a band-pass filter is applied in order to extract only the cyclical components of the time series, which are presented in Figure 2. The frequency range of the filter, which determines the upper and lower limits of the cycle length to be extracted, is set in advance. When extracting cyclical components from indicators used to estimate the financial cycle using a band-pass filter, a frequency of 32 to 120 quarters (or 8 to 30 years) is traditionally used in the literature. The same frequency is used in the present study. Due to the standardization of the indicators, the crossing of the zero axis can be interpreted as a boundary between the phases of accumulation of cyclical risk (in case of a positive deviation from the zero axis) and materialization of risk (in case of a negative deviation from the zero axis).

Figure 2 Cyclical components of the indicators used to assess the financial cycle



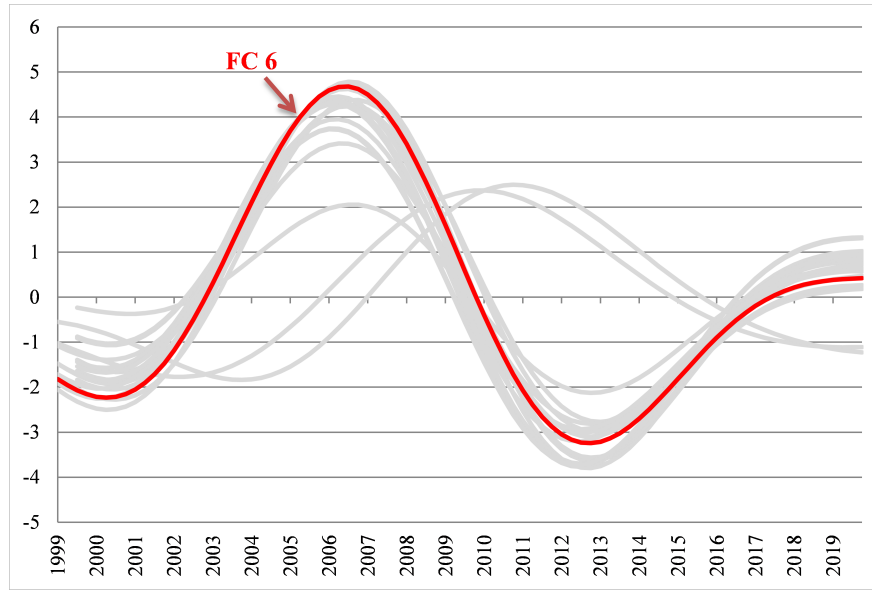
Based on the cyclical components extracted from the selected indicators for assessing the financial cycle, it can be concluded that from 2017 an accumulation of cyclical risk is observed in respect to rising house prices, declining interest rate spreads, growing profits in the banking sector and accelerating growth of lending to households. From the end of 2018, an accumulation of risk is also observed in terms of accelerating growth of loans to non-financial corporations.

In order to derive an aggregate measure of the financial cycle, the cyclical components of the selected indicators are grouped into different groups and using the principal components method the first principal component is extracted from each group, which explains most of the variation in the group. In this way, a set of potential measures of the financial cycle is obtained. Based on the results of the principal components analysis and on calculated indices of synchronization between the indicators included in each group and the aggregate measure derived from them, the most appropriate of the potential measures of the financial cycle is selected, which is denoted as FC6 in Figure 3.

The results from the assessment of the financial cycle show that from 2017 the Bulgarian economy has entered the phase of gradual accumulation of cyclical risks in the financial system.<sup>1</sup>

<sup>1</sup>For more details see: Karamisheva, T., G. Markova, B. Zahariev and S. Pachedzhiev (2019): "Financial Cycle in the Bulgarian Economy and Its Interaction with the Business Cycle", Annual of the Bulgarian National Bank, Volume 1, ISSN 2683-0728, p.13-54.

Figure 3 Potential measure of the financial cycle (FC 6) and alternatives



*Note: The grey lines show all possible alternatives to the selected potential measure of the financial cycle in Bulgaria (FC6), derived by combining the selected indicators.<sup>2</sup>*

## 4.2 Assessment of the business cycle in Bulgaria using a structural unobserved components model

For the assessment of the business cycle in Bulgaria, a structural unobserved components model is applied, based on the use of the maximum likelihood method and a Kalman filter for decomposing a set of observable variables into trend and cyclical components. The model applied consists of four building blocks: aggregate demand (IS curve), aggregate supply (Phillips curve), monetary policy response function, and Okun's law. Special attention in the model is paid to the influence of monetary conditions on the cyclical deviations in the economy by incorporating them into the aggregate demand curve.

### Aggregate demand – IS curve:

Within the model, the business cycle (the deviation from potential GDP –  $\hat{y}_t$ ) is represented as a function of the output gap in the previous period ( $\hat{y}_{t-1}$ ), of a monetary conditions index ( $mci_t$ ) and of the output gap in the euro area ( $\hat{y}_t^*$ ).

$$\hat{y}_t = b_1 \hat{y}_{t-1} - b_2 mci_t + b_3 \hat{y}_t^* + \epsilon_t^y \quad (7)$$

The monetary conditions index is a combination of the cyclical component of the real interest rate (the deviation of the real interest rate from its long-term trend –

<sup>2</sup>The assessment of the aggregate measure of the financial cycle is based on standardization of a set of indicators (by subtracting from each observation the average value of the respective indicator and dividing it by the standard deviation), extracting the cyclical components from the standardized indicators using the band-pass filter, grouping the cyclical components obtained and extracting the first principal component by applying the principal components analysis. This explains the lack of a measurement unit on the graph.

$\hat{r}_t$ ) and the cyclical component of the real exchange rate (the deviation of the real exchange rate from its long-term trend  $-\hat{z}_t$ ),

$$mci_t = b_4(\hat{r}_t + cr\_prem_t) + (1 - b_4)(-\hat{z}_t) \quad (8)$$

where the real interest rate ( $r_t$ ) is defined as the difference between the nominal interest rate ( $i_t$ ) and the expected inflation ( $E_t\{\pi_{t+1}\}$ ),

$$r_t = i_t - E_t\{\pi_{t+1}\} \quad (9)$$

while the real exchange rate ( $z_t$ ) takes into account the relationship between the nominal exchange rate ( $s_t$ ), the country's price level ( $p_t$ ) and the euro area price level ( $p_t^*$ ).

$$z_t = s_t + p_t^* - p_t \quad (10)$$

A positive deviation of the real interest rate from its long-term trend is equivalent to tightening monetary conditions, which has a negative impact on aggregate demand. At the same time, a positive deviation of the real exchange rate (interpreted as a depreciation of the local currency) from its long-term trend is equivalent to a relaxation of monetary conditions, since the real depreciation of the currency makes local goods and services more competitive, thus stimulating exports and thus having a positive impact on economic growth.

Aggregate supply and price setting – New Keynesian Phillips curve:

The use of a new Keynesian type of the Phillips curve is a standard approach in the academic literature to represent the price setting and thus the supply side of the economy. Within the New Keynesian formulation, the original Phillips curve is modified to include both past inflation ( $\pi_{t-1}$ ) and inflation expectations ( $E_t\{\pi_{t+1}\}$ ). Real activity i.e. output gap enters the Phillips curve via overall real marginal cost ( $rmc_t$ ).

$$\pi_t = a_1\pi_{t-1} + (1 - a_1)E_t\{\pi_{t+1}\} + a_2rmc_t + \epsilon_t^\pi \quad (11)$$

The real marginal cost is presented as a function of the output gap ( $\hat{y}_t$ ) and the real exchange rate gap ( $\hat{z}_t$ ).

$$rmc_t = a_3\hat{y}_t + (1 - a_3)\hat{z}_t \quad (12)$$

The domestic output gap is used as an approximation of the marginal cost of production of local producers, since increasing demand is a prerequisite for local firms to increase the use of spare production capacity, which leads to an increase in production costs (due to additional hours worked subject to additional payment, depreciation of equipment, etc.) and higher costs are partly carried over into final prices. At the same time, the real exchange rate gap approximates the marginal costs of importers of goods and services. An appreciation of the exchange rate, resulting in a positive deviation from the equilibrium level, leads to an increase in marginal costs

for importers, which, in order to recover their profit margins, carry some of the higher costs into final consumer prices.

Monetary policy response function:

Due to the operating in Bulgaria regime of a fixed exchange rate of the Bulgarian lev to the euro, the Bulgarian National Bank is not able to conduct an independent monetary policy and to set the level of the short-term interest rate. In a currency board arrangement, the monetary policy transmission mechanism reflects the effects of ECB monetary policy on the local market. Thus, interest rates on the interbank money market in Bulgaria reflect the dynamics of euro area money market interest rates. In order to take into account the specific characteristics of the Bulgarian economy, the interest rate policy of the central bank is reduced to the following relationship:

$$i_t = E_t \Delta s_{t+1} + i_t^* + prem_t + \epsilon_t^i \quad (13)$$

This relationship reflects the fact that the central bank does not pursue an independent monetary policy. Interest rates in Bulgaria are influenced by the level and dynamics of euro area interest rates ( $i_t^*$ ) and a certain risk premium ( $prem_t$ ). Due to the currency board arrangement, the change in the nominal exchange rate in period  $t + 1$  relative to period  $t$  equals zero  $E_t \Delta s_{t+1} = 0$ .

Okun's Law:

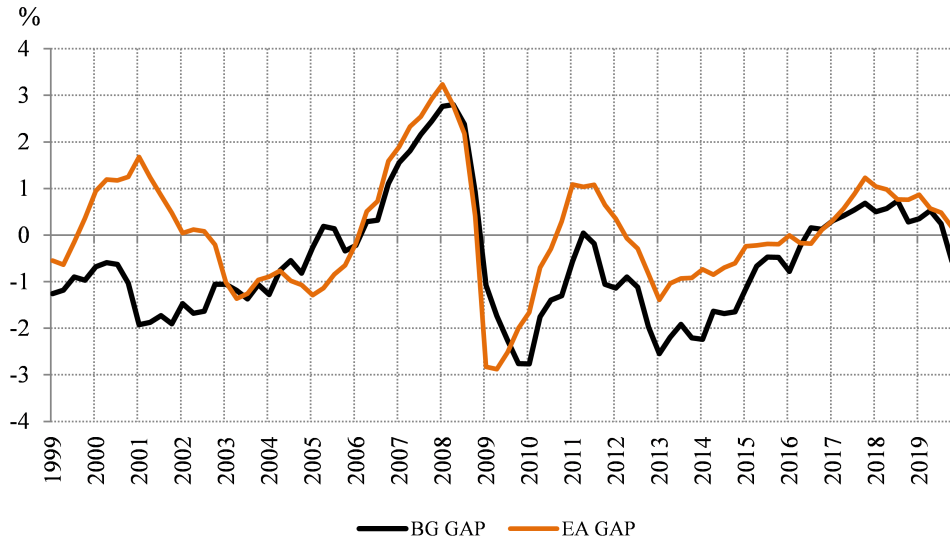
The Okun's law takes into account the relationship between the output gap ( $\hat{y}_{t-1}$ ) and the unemployment gap ( $\hat{u}_{t-1}$ ). The inclusion of this relationship in the model can be justified by the fact that the period after the financial crisis of 1996-1997 and the introduction of the currency board in Bulgaria was characterized by both high inflation and very high unemployment, which had a negative impact on potential output.

$$\hat{u}_t = c_1 \hat{u}_{t-1} - c_2 \hat{y}_{t-1} + \epsilon_t^u \quad (14)$$

The structural unobserved components model is based on the assumption that in the long run all deviations from the long-run equilibrium are closed, inflation is close to target inflation (in the case of Bulgaria, close to long-term inflation), interest rates are at equilibrium levels, and the level of the unemployment rate is close to its natural level. The presented structural unobserved components model is estimated with data for the period 1999 Q1 -2019 Q4. The data used for Bulgaria include seasonally adjusted real GDP (at 2015 prices), nominal effective exchange rate and nominal interest rates on loans, the harmonized index of consumer prices, data on core inflation, food and energy inflation, as well as data on the unemployment rate. Data for the euro area include real seasonally adjusted GDP, the harmonized index of consumer prices, the 3-month Euribor and the price of oil in USD.

The estimated business cycles in Bulgaria and in the euro area are presented in Figure 4.

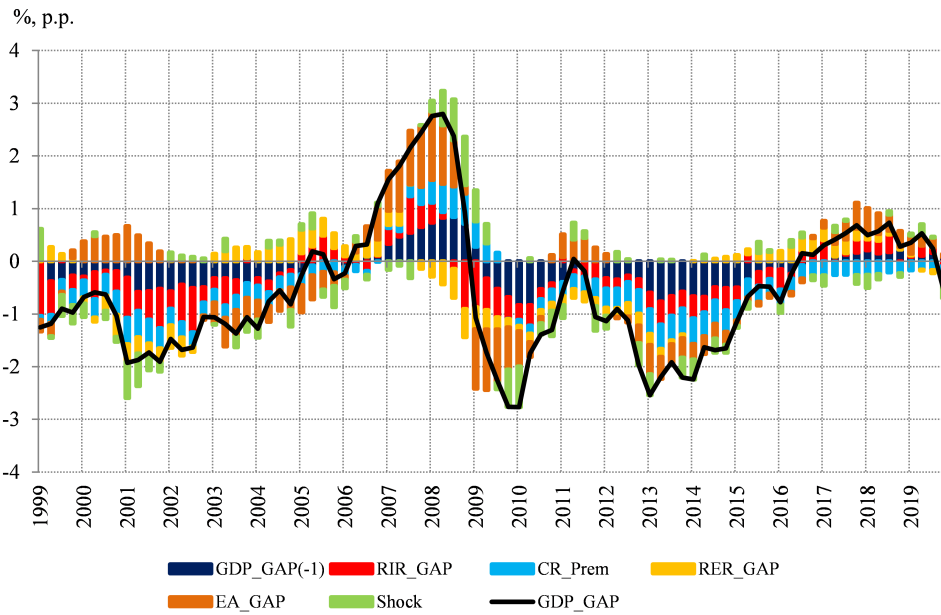
Figure 4 Business cycles in Bulgaria (BG GAP) and in the euro area (EA GAP)



The conclusion that can be drawn both from the purely visual examination of the two cycles and by calculating the index of synchronization between them is that they are relatively well synchronized, with the degree of synchronization increasing after Bulgaria’s accession to the EU. The calculated concordance index between the business cycles in Bulgaria and in the euro area for the entire studied period from 1999 to 2019 shows that the two cycles are synchronized in 59% of the time. At the same time, if the indices of synchronization between the two cycles are calculated separately for the period before and after the accession of Bulgaria to the European Union, it can be concluded that the degree of synchronization increases significantly reaching 65 % for the period 2007 - 2019 compared to 48% for the period 1999 - 2006.

Figure 5 shows the historical decomposition of the business cycle in Bulgaria, which makes it possible to highlight the contribution of the individual variables included in the aggregate demand curve to the deviations from potential output.

Figure 5 Historical decomposition of the business cycle in Bulgaria



*Legend:*

*GDP\_GAP* – output gap

*GDP\_GAP (-1)* – output gap in  $t-1$

*RIR\_GAP* – real interest rate gap

*CR\_Prem* – risk premium

*RER\_GAP* – real exchange rate gap

*EA\_GAP* – output gap in the euro area

*Shock* – external shocks

After the hyperinflation and the financial and economic crisis of 1996-1997 and the introduction of the currency board in Bulgaria, in the period 1999-2004, the economy was still operating below its optimal production capacity. This period was characterized by high unemployment ranging between 12% and 20% and relatively high inflation. From the historical decomposition of the business cycle it can be concluded that the main factors contributing to the negative deviation of real GDP from its potential level during this period were the monetary conditions in the country and in particular the positive deviation of real interest rates on loans from their long-term trend and the relatively high risk premium. At the same time, in the period 2000-2002 the business cycle in the euro area was positive, but due to the still insufficient integration of Bulgaria into the European Union, the business cycles in Bulgaria and in the euro area were poorly synchronized in that period.

The signing of the Treaty of Accession of Bulgaria to the European Union in 2005 had a positive impact on the economic activity in the country. After 2005, the business cycle in Bulgaria followed closely that in the euro area, moving at a slight lag. Between 2006 and 2009, both the upswing in the European and global business cycles contributed to the high growth of Bulgaria's real GDP. During this period, the monetary conditions in the country also supported the business cycle, with spreads



between interest rates on new loans to households and non-financial corporations with the 3-month EURIBOR significantly declining, which was indicative of a decrease in the risk premium.

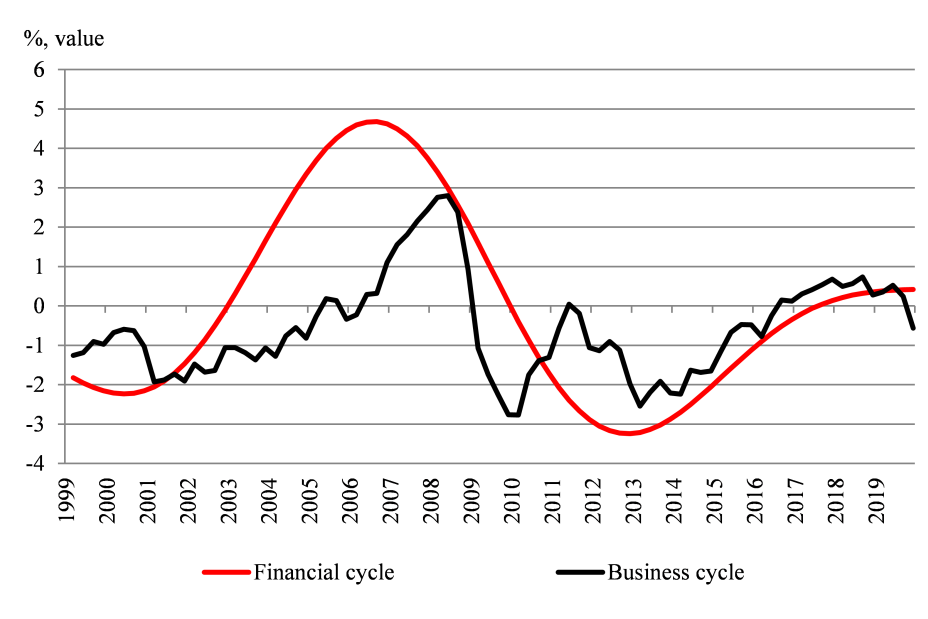
The positive deviation from potential output peaked in the second quarter of 2008. With the spreading of the aftermaths of the global financial and economic crisis in late 2008 and early 2009, the business cycle in Bulgaria entered its downward phase, turning into a negative territory in the first quarter of 2009 and reached its trough at the beginning of 2010. The main driving force behind the significant negative deviation from potential output in this period was the cycle in the euro area and globally. This period was also characterized by a significant increase in interest rate spreads and risk premiums in a number of countries, with similar developments observed in Bulgaria.

A gradual recovery had been observed since mid-2010, with the negative output gap gradually closing, but with the deepening of the European debt crisis, the Bulgarian economy plummeted again and reached another trough in mid-2013. The period of a negative deviation from potential output continued until mid-2016. Both the euro area business cycle and the relatively high interest rate spreads and the higher risk premium in the country contributed to these developments. From mid-2016, with the gradual recovery of the European economy the output gap in Bulgaria turned to positive and remained positive till the third quarter of 2019.

### 4.3 Relationship between the financial cycle and the business cycle

In this part of the dissertation the selected aggregate measure of the financial cycle FC6 is compared with the estimated business cycle for Bulgaria with the aim of testing the hypothesis for the existence of synchronicity between them over time. The dynamics of both cycles is presented in Figure 6.

Figure 6 Business cycle and financial cycle measure (FC 6)



The study of the dynamics of the selected measure of the financial cycle (FC6) and the business cycle leads to the conclusion that the two cycles are relatively well synchronized.

In the period 1999-2003, the negative deviation from potential output corresponded to the high unemployment and high inflation during this period. At the same time, this period was characterized by moderate credit growth, a low credit-to-GDP ratio, relatively high interest rate spreads in Bulgaria and in the euro area and low banking sector profits. The average annual growth of the house price index was close to 0%. These developments explain the dynamics of the chosen measure of the financial cycle, according to which in this period the Bulgarian economy was in the phase of risk materialization. It is important to stress that in this period there were structural factors that affected banking system developments in Bulgaria. They were related to the high share of state-owned banks, in whose balance sheets the share of non-performing loans was relatively high and which were quite cautious when granting new loans to the private sector. Meanwhile, the bank privatization was an important factor that marked the beginning of the gradual process of restructuring of the banking sector in Bulgaria.

Since 2003, the process of structural reforms and privatization of many local banks by foreign financial institutions had contributed to deepening financial intermediation in the country. Parent banks were starting to provide their subsidiaries and branches in Bulgaria with capital, liquidity and know-how, intending to increase their market share in the region, where the return on capital was very high. These processes stimulated strong competition between banks and contributed to the gradual acceleration of credit growth. During this period, the demand for loans was also high, stimulated by internal and external factors. The high expected return on investment and positive expectations for income convergence related to the process of gradual transition to a market economy, as well as the favorable domestic macroeconomic environment and the global upswing in the business cycle stimulated consumption, investment and FDI inflows in the country. Growing revenues and profits, on the other hand, contributed to an increase in attracted funds in the banking system. By financing their lending activities mainly with deposits from residents and with funds from parent banks, credit institutions in Bulgaria were expanding their operations and activities in the country, which contributed to further acceleration of credit growth. The period from 2004 to 2007 was characterized by declining spreads between interest rates on loans in Bulgaria and the 3-month EURIBOR, reflecting the lower perception of risk. At the same time, high credit growth contributed to an increase in bank profits and, among other factors, to rising house prices. During the period considered, the current account deficit increased as a percentage of GDP, as a result of the high level of investment in the economy and strong domestic demand (in particular investment demand stimulated by FDI inflows), which was reflected in higher growth of imports compared to exports.

In line with these developments, the chosen measure of the financial cycle in Bulgaria (FC6) shows that during this period the economy was in a phase of risk accumulation, with the peak occurring in the third quarter of 2006, earlier than the peak of business cycle. A possible explanation for the reversal of the financial cycle earlier than the business cycle could be the introduction of a number of countercyclical measures by the BNB in 2005 and 2006 aimed at slowing down and stabilizing the growth rate of credit to the private sector to sustainable levels in the medium term, without jeopardizing the financial stability of the country. It can be argued that these administrative measures were effective in limiting the growth of credit to households and non-financial corporations and even in limiting the growth in house prices and thus contributed to reducing the accumulation of risk in the financial system.

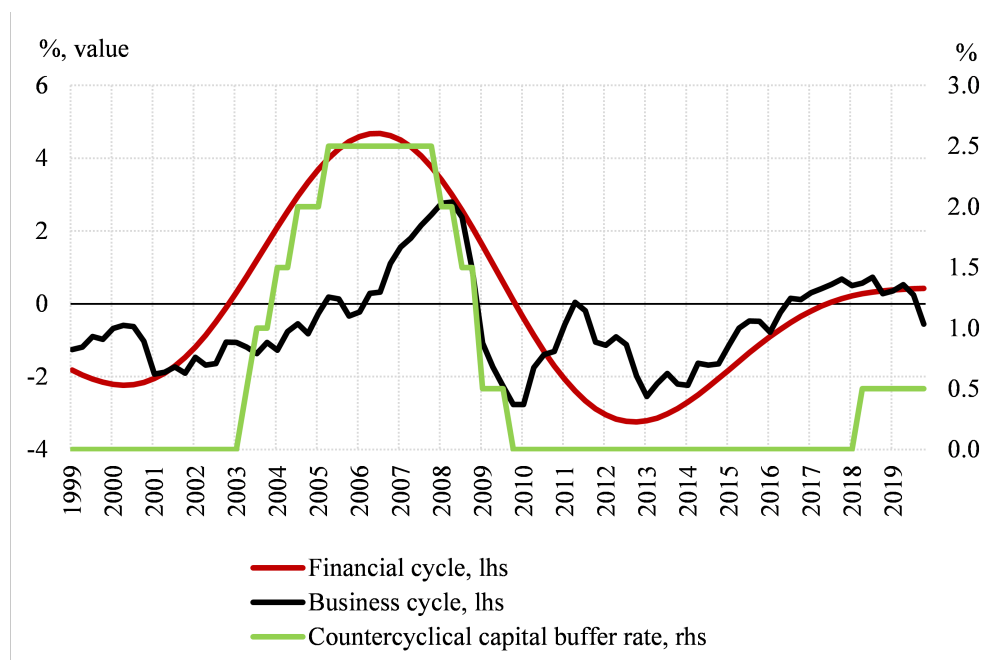
The positive deviation from potential output peaked in the second quarter of 2008. With the spreading of the effects of the global financial and economic crisis at the end of 2008 and the beginning of 2009, the business cycle in Bulgaria entered its downward phase and passed into a negative territory in the first quarter of 2009, reaching its trough in early 2010. Following the developments in the real sector, the financial cycle entered the phase of risk materialization in the first quarter of 2010, which coincided with the trough of the business cycle and this phase lasted until mid-2017. According to the chosen measure of the financial cycle, in 2017 the economy entered the initial phase of risk accumulation, while at the same time there was a positive output gap. The phase of risk accumulation in the financial system was maintained until the end of 2019.

A notion of the degree of synchronization between the selected measure of the financial cycle in Bulgaria (FC6) and the business cycle can be obtained by calculating the corresponding index of synchronization between them, which shows that the two cycles are synchronized in 53 % of the time. By using the turning points analysis, conclusions can also be drawn about the peak and trough of both cycles, as well as about their length and amplitude. According to the results of the turning points analysis, the length of the financial cycle is estimated at approximately 13 years, while the length of the business cycle (measured from peak to peak) is about 6 years. In general, the assessments for Bulgaria confirm the generally accepted view in the academic literature that the financial cycle is longer than the business cycle and is characterized by significantly higher volatility and amplitude. Here it is necessary to point out that due to the relatively short analyzed period, the conclusions about the length and amplitude of the financial cycle are based on the parameters of a single cycle, which requires them to be interpreted with some caution. With the accumulation of more observations, it is possible that these estimates will change.

## Chapter 5 Application of the financial cycle estimates in the macroprudential policy decisions taking process

A possible way to apply the estimate of the financial cycle to determine the level of the countercyclical capital buffer is to take into account the length of the cycle and the average duration of the phase from the trough to the peak of the cycle and the so-called recovery phase and expansion phase. According to the results of the assessment of the aggregate measure of the financial cycle, its average length is approximately 13 years. Accordingly, the length of the phase from the trough to the peak of the cycle is approximately 6 and a half years. This phase can be divided into a recovery phase in which the economy is slowly rising from the trough, but there is still a materialization of risks and an expansion phase, which is associated with the gradual accumulation of cyclical systemic risk in the financial system. According to the estimates, the average duration of the expansion phase in Bulgaria is about 4 years. In order to be able to determine the level of the countercyclical buffer by quarters, two assumptions are made. The first is that the maximum value of the aggregate financial cycle measure corresponds to the maximum possible buffer size of 2.5 %. The second assumption is that the level of the countercyclical capital buffer becomes different from 0 % in the first quarter with a positive value of the aggregate measure of the financial cycle, i.e. in the first quarter of the expansion phase.

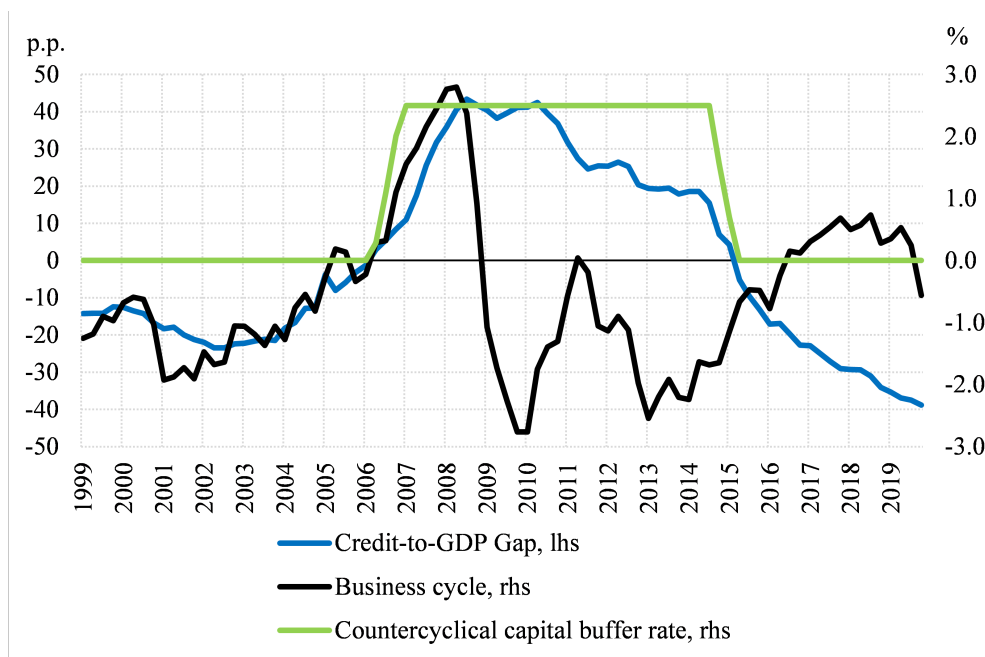
Figure 7 Financial cycle, business cycle and countercyclical capital buffer rate



The size of the buffer between the first quarter with a positive value of the financial cycle measure and the quarter with the maximum value of this measure is linearly interpolated. In this way, 6 ranges of values of the financial cycle measure and their corresponding rates of the countercyclical capital buffer are obtained. By applying the ranges thus calculated to the financial cycle estimate, hypothetical buffer rates are obtained (see Figure 7). Due to the existence of synchronization between the estimated measure of the financial cycle and the business cycle, the proposed approach assumes the accumulation of capital buffers in good times and their release in bad ones, which is the main idea and goal of the countercyclical capital buffer.

The use of the deviation of the credit-to-GDP ratio from its long-term trend leads to different results. The presence of a negative correlation between the deviation of this ratio from the trend and the business cycle during a large part of the studied period leads to a maximum hypothetical value of the buffer in the periods when the deviation from potential output is negative. Contrary, the assumed size of the buffer is 0 % in the period 2017 - 2019, when a positive business cycle is already observed and there are indications for accumulation of risks in the financial system based on other indicators alternative to the credit-to-GDP ratio (see Figure 8) <sup>3</sup>.

Figure 8 Deviation of the credit-to-GDP ratio from its long-term trend, business cycle and countercyclical capital buffer rate



<sup>3</sup>Note: The level of the countercyclical buffer in this case is calculated on the basis of the methodology provided in the ESRB recommendations

## Conclusion

In conclusion, the main results and conclusions of the study can be summarized.

The study of the factors for credit growth at the macro level shows that demand-side factors are more important in explaining credit dynamics than supply-side factors. A more in-depth study of the driving factors of credit growth at the micro level through the use of individual banks data shows that both factors on the demand side and on the supply side are important for explaining the dynamics of corporate lending. According to the results, the constructed variables for increase, respectively decrease in demand and for easing of credit standards have a statistically significant effect on growth of credit to enterprises. These results remain stable when additional macro and micro explanatory variables are included in the analysis. In addition to the Bank lending survey indicators, a statistically significant impact on credit growth is found in terms of macro variables such as real GDP growth, the share of non-performing loans in banks' portfolios and the business climate in the country, as well as in terms of individual bank variables such as the spread between interest rates on corporate loans and deposits by bank and individual capital-to-assets ratios. The coefficients in front of these variables show the expected signs: positive for real economic activity, the business climate and individual for banks interest rate spreads and capital to assets ratios and negative for the share of non-performing loans in total loans to the private sector.

The fourth chapter of the dissertation presented an assessment of the financial cycle in the Bulgarian economy, obtained by aggregating information from a wide range of macroeconomic and financial indicators - the ratio of credit to non-financial corporations and households to GDP, annual growth of credit to the private sector, debt burden, interest rate spreads, annual growth in house prices, current account deficit and indicators of stability of the banking system. The assessment showed that from 2017 the Bulgarian economy entered the phase of gradual accumulation of risks in the financial system. The assessment of the phases of the financial cycle in Bulgaria by summarizing the information from a wide range of indicators can help to identify the most appropriate moments for the accumulation or release of countercyclical buffers. The accurate identification of these moments will help to achieve greater flexibility and resilience of the financial system to shocks.

The assessment of the business cycle in Bulgaria was obtained by applying a structural unobserved components model, consisting of an IS curve, Phillips curve, Okun's law and an interest rate response mechanism, consistent with the functioning currency board arrangement in Bulgaria. The results showed that in the period 1999 - 2004 the Bulgarian economy was operating below its optimal production capacity. The peak of the economic cycle was reached in the middle of 2008, followed by a period of a decline, corresponding to the period of the global financial and economic crisis and a second downturn corresponding to the period of the European debt crisis. Since mid-2016, the Bulgarian economy had operated above potential and this phase continued

up to Q3 2019. Another conclusion of the study is that the business cycle in Bulgaria is to a large extent synchronized with the business cycle in the euro area, with the degree of synchronization increasing after the accession of Bulgaria to the European Union.

The comparison of the estimated financial cycle and business cycle for Bulgaria showed that the two cycles are relatively well synchronized, with the index of synchronization between them amounting to 53 %. Using the turning point analysis, conclusions were drawn about the peak and trough of both cycles, as well as about their length and amplitude. Based on the analysis of turning points, it was concluded that the length of the financial cycle is approximately 13 years, while the length of the business cycle (measured from peak to peak) is about 6 years. In general, the assessments for Bulgaria confirm the generally accepted view in the academic literature that the financial cycle is longer than the business cycle and is characterized by significantly higher volatility and amplitude.

The aim of the last chapter of the dissertation was to propose an approach for using the assessment of the financial cycle when applying the macroprudential policy instruments of the Central Bank and in particular when setting the countercyclical capital buffer rate. Due to the synchronization between the estimated measure of the financial cycle and the business cycle, the proposed approach assumes the accumulation of capital buffers in good times and their release in bad times, which is the main purpose of the countercyclical capital buffer.

## **Publications**

### **Publications related to the dissertation**

1. Karamisheva, T.: „Analysis of the bank lending survey results for Bulgaria: (for the 2003-2014 period) “, published in “Crisis, credit and resource misallocation: evidence from Europe during the Great Recession”, London, UK: CEPR Press, ISBN 978-0-9954701-8-7, 2017, p. 7-49.
2. Karamisheva, T., G. Markova, B. Zahariev and S. Pachedzhiev (2019): “Financial Cycle in the Bulgarian Economy and Its Interaction with the Business Cycle”, Annual of the Bulgarian National Bank, Volume 1, ISSN 2683-0728, p. 13-54.
3. Karamisheva, T.: „Measuring the Business Cycle in Bulgaria“, Economic Studies Journal, 4/2021, 22 p. (under print).
4. Karamisheva, T.: „Using Bank Lending Survey results for explaining changes in the dynamics of credit to non-financial corporations in Bulgaria“, Annual of the Sofia University St. Kliment Ohridski, ISSN 1311-8420 (under print).
5. Karamisheva, T.: „Using an aggregate measure of the financial cycle for setting the countercyclical capital buffer rate in Bulgaria“, Discussion papers and Annual

of the Bulgarian National Bank (under print).

## **Participation in scientific forums**

1. Presentation at the conference "12th SEE Economic Research Workshop" organized by the Central Bank of Albania, Tirana, December 6-7, 2018.
2. Presentation at the conference "Macroeconomic Imbalances and EU Convergence" organized by the Central Bank of Bosnia and Herzegovina, Sarajevo, November 7, 2019.
3. Presentation at the conference "17th ESCB Emerging Markets Workshop" organized by the Austrian National Bank, Vienna, December 9-10, 2019.