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Economic Policy Under Global Flight to Safe Assets and Effective Lower Bound: the Bulgarian Prospects

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Abstract

The study is motivated by the (global) trend of excess savings and the restrictive response to investment in productive capital despite abundant financing. While there is heterogeneity among countries, in Bulgaria we can observe both declining market interest rates (r^m) and long-standing investment stagnation in terms of gross capital formation as a share of GDP. This stylized fact can be described and explained through the Neo-Wicksellian concept of the natural interest rate (r*), with potentially secular low values of r* posing serious challenges to further stimulating interest-sensitive aggregate expenditures. In contrast to other studies, a trend towards a decrease in the natural interest rate is observed for Bulgaria, which provides a more accurate explanation for the structural factors, including underutilized fiscal space (with r*<g). In addition, the nominal rate gap – defined as the spread between the r^m and the estimated nominal r* was used as robustness check. The measured nominal rate gap covers a risk premium shift and potentially a large range of other financial (or institutional) factors, but it is still an informative indicator for financial conditions and reveals a strong explanation of private fixed capital expenditures variance in the last two decades.

Keywords: Natural Interest Rate, Private Investments, Public Debt Sustainability, ELB (Effective Lower Bound)

JEL: E52, E58, E63

Introduction

The decades of globalization, demographic shifts, and financial liberalization, dating back at least to the 1980s, have been marked by a rapid and uneven accumulation of wealth both between and within countries (Zucman, 2019; Tsoklinova, 2016), and a concomitant significant increase in demand for stable and liquid financial assets. The disparity between the capacity to issue such assets and potential economic growth is one of the leading channels for the sustained decline in the (real) long-term natural interest rate (hereafter r*) (Caballero et al., 2021). Over time, the decline in r* has been facilitated by the trend toward risk aversion and the "flight to safety" amid the profound uncertainty following consecutive economic crises since 2008 (Brunnermeier et al., 2022), the increase in life expectancy (Blanchard,

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2023), and endogenously by monetary policy itself (Schnabel, 2024). It is considered that if the market interest rate, adjusted for expected inflation, is close to the real natural rate, savings are equal to investments in the capital fund market (Wicksell, 1898). On the other hand, there is an approach wherein the definition of r* allows the concept to be applied to monetary policy, viewing it as a short-term interest rate at which financial conditions are neutral—neither stimulating nor restricting economic activity (Woodford, 2003). There may be short-term deviations between the two concepts, but over longer periods they gravitate sufficiently, so most conclusions in the research pertain to both.

When the global economy experiences exceptionally low r* and is constrained by the effective lower bound (ELB)—the point below which holding and using cash would be preferable to holding deposits with negative returns—adverse shocks are primarily absorbed through output due to the inability of the interest rate to be sufficiently flexible. Since the interest rate directly affects fiscal policy by determining the cost of government borrowing, changes lead to alterations in fiscal space—the government's capacity to borrow and spend without fiscal sustainability risks (Beev and Todorov, 2019). A lower r* provides an opportunity for fiscal activation, which transforms the interaction between monetary and fiscal policy. It is thus no surprise that the number of statements by central bank members mentioning the natural interest rate and the attainment of the ELB has been steadily increasing (Borio, 2021), indicating the high relevance and significance of the issue.

Given the indicated research interest, **the object of this study** is the change in the natural interest rate in the context of global flight to safe assets and the attainment of the ELB, and correspondingly, the transformation of monetary-fiscal policy interaction. **The specific focus** is on the prospects for Bulgaria (as an example of an open economy with a fixed exchange rate) and optimizing the country's economic policy. **The aim** is to confirm the concept of r*, which is relatively poorly applied in Bulgaria and to analyze the relationship between the natural interest rate and demand-side problems (which also evolve into supply-side issues) in the face of a prolonged restrictive response to investment in production capacity, despite the availability of financing sources. To achieve this aim, several (primarily empirical) **research tasks** are undertaken, relating to the analysis of dynamic macroeconomic determinants, such as *the income velocity of money*—expected to contain important information about the natural interest rate under monetary regimes that make inflation stationary (see Benati, 2020); *the private investments* as interest-sensitive components in the real sector; and *the difference between the natural interest rate* (and related risk-free interest rate) *and economic growth (r-g)*, which is crucial for determining the fiscal space of the public sector. **The author argues** that r* in Bulgaria has a downward trend and is currently at exceptionally low levels, which are likely to persist for a prolonged period. Under these circumstances, interest-sensitive expenditures, such as private investments, stagnate regardless of declining market interest rates on new business loans (and currently lower than historical averages). The research hypothesis is being verified with **some limits and country specifics** such as the absence of an monetary policy rate in the terms of the currency board regime in Bulgaria, the long-period availability of series and greater than

usual uncertainty and inflation at the end of the period may bias stationarity process of CPI - therefore the focus in the paper is on the *nominal* rather than the inflation-adjusted or *real* interest rate (discussed below). This restricts the examination of the factors behind the secular decline in private investment in the country to only indirect indicators (through financial conditions). Nevertheless, in the author's point of view, the paper may be the strong basis for further an additional research base for empirics and evidence in the future.

The structure of the study is determined by the tasks set and follows this sequence: in addition to the present introduction, a brief literature review is provided, focusing on theoretical and empirical studies regarding the natural interest rate and the economy's position at the ELB. Subsequently, methodological notes and the data needed for the empirical core of the study are presented. The empirical analysis itself includes stages of cointegration linkage measurement of the natural interest rate, structural VAR, and the results towards fiscal policy transformation. The study concludes with a summary of all these stages, discussing their results and recommending relevant policy projections for economic governance.

Brief literature review

To support their mandates for price and financial stability, and in most cases to achieve maximum employment, in recent decades central banks have most often applied adjustments in interest rates to their expectations of (short-term) r* (Fernández-Villaverde, 2024). In the case of unusually high inflation – such as in the period following the COVID-19 pandemic and military actions on the territory of Ukraine and the Middle East, we witness a rapid and sustained increase in nominal interest rates to make them restrictive (with respect to r*). However, the application of this type of measure in the opposite direction is asymmetrically constrained, since the lower r*, the more likely the economic policy would reach the Effective Lower Bound (ELB). This sets the main perspectives of the present section – *firstly*, what determines the dynamics of r* and *secondly*, what features does reaching ELB lead to.

The global declining trajectory of r* over time has prompted several hypotheses in academic literature (for review see also Vassilev, 2020). The "Secular Stagnation Hypothesis" (Hansen, 1939; Summers, 2014), which gained significant traction post-Great Recession of 2008, suggests a chronic deficiency in aggregate demand and a negative natural interest rate (or at least r* < g (Blanchard, 2023)), leading to a permanent ELB. Conversely, the "Financial Cycle Hypothesis" (Borio, 2017) posits that global economic challenges arise from improper financial expansions, resulting in low interest rates that may not represent equilibrium levels. While the former hypothesis focuses on insufficient aggregate demand and structural changes, the latter emphasizes the consequences of financial crises and the associated risks. Both hypotheses offer different perspectives on global economic challenges, highlighting the importance of understanding the interaction between structural factors and financial cycles in shaping economic outcomes.

Stylized facts over longer periods indicate that r* has significantly declined globally over the past 40 years (Rachel and Summers, 2019), and some evidence suggests this trend extends over the past 400-500 years (Rogoff et al., 2024). Moreover, monetary policy, through its influence on private sector expectations,

endogenously determines the natural interest rate as a result (Rungcharoenkitkul and Winkler, 2022). It is important to note that stylized facts show that transitorily high inflation and structurally low (long-term) r* can coexist. A high inflation episode does not necessarily imply a reversal of low r* over longer horizons. While it may be tempting to extrapolate the current situation of higher interest rates into the future, this does not automatically mark the end of the long-term (century-long) decline of r*. Even classical views (Smith, 1776 [1976]) suggested that as societies become richer, there will be higher wages and lower interest rates. There is a suggestion that following the temporary rise in interest rates due to unusually high current inflation, developed economies are more likely to return to the ELB (IMF, 2023a; Obstfeld, 2023). If these predictions materialize, even in the face of higher costs for green and digital transformation and increased defense spending, leading central banks will again face similar constraints in fulfilling their mandates independently.

Long-term projections about r* are fundamentally based on structural factors, which can sometimes be overturned by transitory economic shocks (the hysteresis hypothesis). The dynamics of fundamental factors such as productivity, inequality, aging population, increased life expectancy, and the transition to a less capital-intensive economy are still considered enduring (e.g., Blanchard, 2023). Lower productivity growth reduces the natural interest rate by decreasing the economy's potential output and demand for investments (though this is unlikely to be proportional). Rising income and wealth inequality can suppress the natural interest rate by reducing aggregate demand and increasing savings levels. Longer life expectancy leads to higher savings rates, affecting the natural interest rate by altering consumption and savings patterns across generations. A lower ratio of working-age individuals to those outside the workforce decreases total savings but reduces incomes proportionally more, thus raising the savings rate (the ratio between the two). These factors are expected to continue exerting negative pressure on the natural interest rate in the future due to excess savings and potentially unproductive use (the latter being a function of imperfections in the financial sector).

Efforts to calculate the ELB (for example Kolcunová and Havránek, 2018) suggest that this bound is not zero but rather slightly negative. Theoretically, reaching the ELB necessitates unconventional monetary policy measures, such as asymmetric rules (strategies) for average inflation targeting and quantitative easing (Spencer et al., 2023). By committing (through forward guidance) to maintaining a zero interest rates post-liquidity trap episode, optimal monetary policy can create a future boom and thus dissipate excessive current savings demand without a significant production drop (Eggertsson and Woodford, 2003; Werning, 2012). The convergence of the neutral (nominal) interest rate around the effective lower bound in recent decades has necessitated the rethinking of many principles established during the high inflation periods and fiscal balancing of the 1980s, which were dominated by monetary policy. A specific case is the European Economic and Monetary Union, where in the early years of the euro, it was considered that the ECB should not share financial-sovereign risk among countries, and the overall fiscal footprint should be minimal. The problem with such a strict interpretation of the division between monetary and fiscal policy in the

Treaty on the Functioning of the EU is that it is not feasible under all circumstances (Draghi, 2014; Lagarde, 2020; Schnabel, 2021; ECB, 2021). One of these "taboos" was changed by increasing central bank balance sheets with government assets through QE programs. Formally, central bank financial independence in most economies implies no automatic consolidation, but in most cases, losses from declines in the value of long-term bonds for the central bank are gains for the consolidated treasury - and vice versa (Bell et al., 2023). Despite the importance of measuring the natural interest rate and the possible reaching of excessively low values to deter interest-intensive aggregate costs, such a focus is mostly absent in Bulgaria with few exceptions (e.g. Vassilev, 2021). One possible reason for the lack of research interest is the inability of monetary authorities to set a monetary interest rate. The present study fills this gap, both through the application of an alternative methodology and the findings made.

Theoretical background

The literature provides several alternatives for estimating r*, most of which are associated with statistical filters combined with theoretical relations (Laubach and Williams, 2003; Holston, Laubach and Williams, 2017) or purely theoretical models (Fuentes and Gredig, 2007; Magud and Tsounta, 2012). Another alternative is the estimation through econometric models (Lubik and Matthes, 2015; Ajevskis, 2018), including the recently employed cointegration between nominal interest rate and Income velocity of money, proposed by Benati (2023). This latter approach is based on the idea that the reverted ratio between M1 and nominal GDP approximates the permanent component of the *nominal* natural interest rate[1] (rN*). In earlier seminal work Selden (1956) and Latané (1960) have established the link between interest rates and the velocity of money without a highly formalized mathematical model. The relationship described can be represented as a positive correlation between income velocity and interest rate and a vector of structural or technological factors that influence velocity in the long run. In a recent paper Benati (2020) specifies that under regimes generating stationary process inflation rate (e.g., an inflation-targeting regime or currency boards anchor to a central bank with such a targeting policy), an estimate of the real natural rate (r*) can be obtained simply by subtracting from the estimated nominal natural rate either inflation's sample average, or the inflation target. If, on the other hand, over the sample period inflation has been I(1), in order to compute the r* it is necessary to purge the rN* of permanent inflations shocks (for examples via Blanchard-Quah long-run restricted SVAR).

A simple theoretical model of transaction demand for money started with labor-only and representative agent economy with uncertainty in which making transactions is costly (for more details see also Benati, Lucas and Nicolini (2017)). The model assumes a representative agent who supplies labor and consumes goods. The agent needs money to facilitate transactions, but holding money is costly due to foregone interest. It incorporates uncertainty, which influences the agent's demand for money as a precautionary measure and transaction costs - making transactions incurs costs, which depend on the amount of money held by the agent.

[1] To obtain the corresponding estimate of the real natural rate it is necessary to take a stand on the integration properties of inflation.

The utility function can be represented as:

$$U = \mathrm{E}_0 \sum_{t=0}^{\infty} \beta^t u(x(s^t)) \quad (1)$$

where $x(s^t)$ is his consumption up through date t, and the function U is differentiable, increasing, and concave. The goods production technology is given by $y(s^t) = x(s^t) = z(s^t)/l(s^t)$, where $l(s^t)$ is time devoted to the production of the consumption good and $z(t)$ is an exogenous stochastic process. The agent is endowed in each period with a unit of time, with $l(s^t)$ allocated to goods production and $1 - l(s^t)$ used to carry out transactions.

Transaction Costs:

The model assumes that making transactions requires money, and the cost of transactions depends on the money holdings relative to the transaction volume. Total cost of making transactions, measured in units of time, by a nonnegative, increasing, and smooth function[2] $\theta(n(s^t), v(s^t))$. The variable $v(s^t)$ can be interpreted as changes over time in the technology to adjust portfolios available to households.

Agent's wealth allocation and motion:

At the beginning of each period, an agent starts with nominal wealth $W(s^t)$, which can be allocated to $M(s^t)$, interest-bearing bonds, B(s), or state-contingent assets $Q(s^t, s^{t+1})$, given that $P^Q(s^t,s^{t+1})$ is the price of an Arrow-Debreu security:

$$M(s^t) + B(s^t) + \\ + \sum Q(s^t, s^t + 1) P^Q(s^t, s^t + 1) \\ \leq \mathrm{W}(s^t) \quad (2)$$

If we divide both sides by $P(s^t)$ and allowing for money to pay a nominal return, lower than the one paid by bonds, which we call $R^m(s^t)$, we can now determine the agent's wealth next period, contingent on the actions taken in the current period and the realization of the exogenous shock s^{t+1}:

$$\omega(s^t,s^{t+1}) \leq \frac{\mathrm{m}(s^t)\,\mathrm{Rm}(s^t) + \mathrm{b}(s^t)\,\mathrm{R}(s^t)}{\pi(s^t,s^{t+1})} + \mathrm{q}(s^t,s^{t+1}) + \\ + \frac{[1-\theta(\mathrm{n}(s^t),\nu(s^t))]z(s^t) - \mathrm{x}(s^t)}{\pi(s^t,s^{t+1})} + \tau(s^t,s^{t+1}) \quad (3)$$

Transaction money demand:

Given (3) and the cash-in-advance constraint in real terms as $x(s^t) \leq m(s^t)n(s^t)$, the first order plus equilibrium conditions can be combined to yield a solution for the equilibrium number of portfolio adjustments, as follows:

$$r^* = (R - R^m) = n^2 \frac{\theta_{\mathrm{n}}(n)}{1 - \theta(n)} \quad (4)$$

The solution for real money balances relative to output is:

$$\frac{m\,(\mathrm{r_t}, \nu_t)}{x\,(\mathrm{r}^*, \nu_t)} = \frac{1}{n(\mathrm{r}^*, \nu_t)} \quad (5)$$

Specifically, if r* is stationary, so m_t/x_t should be, whereas if it is the case that r* has a unit root, m_t/x_t should have a unit root too. Using the Selden-Latané specification of $\theta(n(s^t), v(s^t))$ pointed out in Benati, Lucas and Nicolini (2017) implies a linear relationship between velocity and the interest rate:

$$\mathrm{n_t b} - \mathrm{v_t} \sim \mathrm{r}^* \mathrm{t} \quad (6)$$

Empirical data and econometric strategy

Given the linear relationship between the income velocity of money and the interest rate (eq. (6)) a unit root check and cointegration test must be applied for examination of the statistical long-run relationship between

[2] $n(s^t)$ is number of bank trips, $v(s^t)$ - an exogenous stochastic proces

the two series. When such a cointegration relationship is proven, the nominal natural interest rate becomes an *observable* variable[3]. According to Benati (2020, 2023), the permanent component of rN^*_t is determined by the permanent shocks to inflation, πP_t, and to r*. If the monetary policy regime ensures that inflation can be considered stationary, then permanent changes in the velocity of M1 reflect permanent fluctuations in rN*, preserving the following long-term relationship:

$$V_t = \beta_1 + \beta_2 rN^*_t + v_t \quad (7)$$

where V_t is the reverted ratio of M1 to GDP; rN^*_t is the long run nominal natural interest rate; and v_t represents the shock to the velocity of money.

In an empirical point of view, Equation (7) was specified in the levels of income velocity of money and the interest rate originally estimated by Latane (1960). The current paper uses risk-free rate such as 5y government bonds[4] as regressor to the income velocity of money, so nominal natural interest rate might be built by long-run coefficients according ARDL cointegration analysis (Pesaran et. al., 2001). The Bulgarian currency board anchors to well confidence euro area but given the shorter available time series for Bulgaria (see data description below) and higher than expected end-of-period inflation rate the preferred empirical approach in this paper is to focus on *nominal* natural interest rate, rather than real values. Nevertheless, for a longer period the conclusions for a secular trend of nominal rate should be the same valid for the real natural interest rate given the methodology explained. The nominal rate gap – defined as the difference between the market interest rate to newly business loans and the nominal natural rate – was used to reveal whether (a strong) explanation of interest-intensive aggregate expenditures exists. In this way a permanent shift in risk premium was part of natural interest rate, so the nominal rate gap would be a useful explanatory variable. Specifically, a comparison is made to see whether the spread between the business loan interest rate and the measured natural interest rate is an explanatory variable to variation in private investment compared to other studies (Ivanov et al., 2018).

The robustness check of the model draws inspiration from the method of factor decomposition of shocks and relies on a recursive SVAR model to explain private investments, like other studies on the topic (Ivanov et al., 2018). Vector autoregressive (VAR) models are flexible and help capture complex dynamic interrelationships between macroeconomic variables. The flexibility and data selection capability come from the rich parameterization of VAR models.

[3] This is the advantage reason for applying this methodology instead of modification of statistical filtering approach and assuming *unobservable* components (such as Vassilev, 2021)

[4] In Benati (2020) short term monetary policy rate was preferred but the alternative using of government bond yields was not sensitive to estimation because high correlation between them. In Bulgarian currency board the policy interest rate was not applicable indeed.

Table 1. Data description

Variable	Source	Time period	Description
M1	BNB	1999Q1-2023Q4	Monetary aggregate M1 (adjusted according up to 2021 methodology)
V	BNB and NSI	1999Q1-2023Q4	Income velocity of money (sum of the last four quarters current price GDP toM1)
Interest rate	BNB	2005Q1-2023Q4	risk-free interest rate (5y government bonds)
FDI flows	BNB and NSI	1999Q1-2023Q4	FDI flows to GDP ratio
Profits	NSI	1999Q1-2023Q4	Profits in industry as a share of the last 4 quarterly GVA
Private investments	NSI	1999Q1-2023Q4	Total minus government gross fixed capital formation, deflated
Bank interest rate	BNB	1999Q1-2023Q4	Short term Newly business loans interest rate
Interest rate gap	Own calculations	n/a	Short term Newly business loans interest rate adjusted to measured Natural nominal interest rate

In a more compact notation, the VAR model can be written as:

$$Y = XB + \varepsilon \quad (8)$$

where Y is T x N matrix, representing the total number of observations and the number of variables (endogenous and exogenous); B is a matrix of appropriate dimension containing the unknown parameters of the model.

Potential investment dynamic explanatory variables (Table 1) include FDI inflows to GDP, reflecting international funding sources; business profits as a share of GDP, reflecting internal sources; and one of the two alternative measures for the capital market—either the interest rate spread relative to rN* or the real interest rate.

Measurement of the Natural Interest Rate

Results from Augmented Dickey–Fuller and Phillips–Perron unit-root tests are inconclusive as to whether all variables are I(1), however, none appears to be I(2) at conventional significance levels (see Appendix 1). This allows for adherence to the requirements for cointegration analysis according to the Bound test (Pesaran et. al., 2001). The number of lags was determined based on the Akaike Information Criterion (AIC) at 0,1 with a maximum of 4, which is a common practice for quarterly data. Stability checks of the model reveal no serial correlation, indicating that the model is well-specified (CUSUM test).

The empirical cointegration relationship in Equation (7) between the velocity of M1 and the nominal interest rate on 5-year government bonds is confirmed at a 2.5% significance level (see F-statistic in Appendix 1) for the period (given lags included) from 2006Q1 to 2023Q4, for which data are available. Subsequent calculations assume constant and extrapolated coefficients back to 1999Q1. Specifically, the coefficient β_2 demonstrates high statistical significance, although this cannot be unequivocally stated for the intercept coefficient β_1. The latter may proportionally shift the measurement upward.

The observation that interest rates (on business loans) in Bulgaria are relatively lower

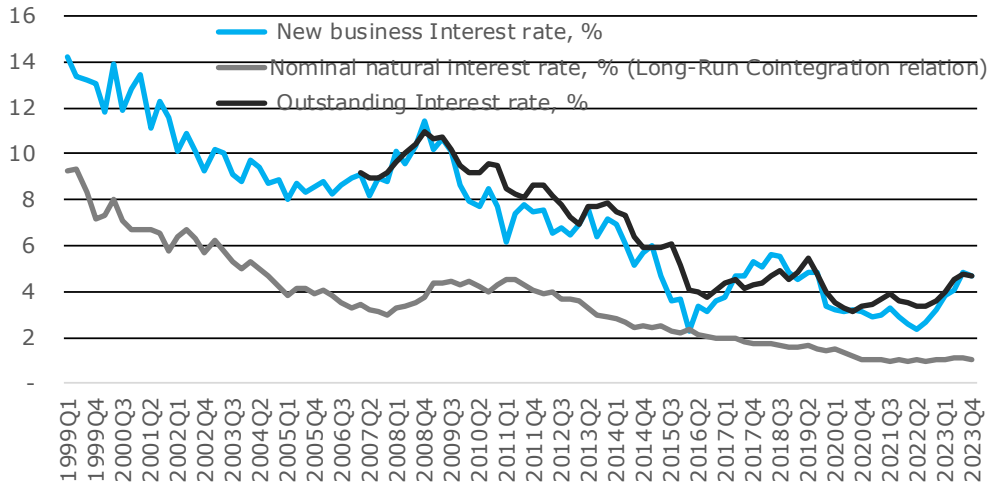

Figure 1. Bank interest rate on business loans and natural interest rate in Bulgaria 1999 – 2023, %
Source: own calculations on Nominal natural interest rate and BNB for interest rate on business loans

than the historical average in the medium term (Figure 1) over the last few decades is of limited informative value by itself. This is because the natural rate of interest has also been persistently declining, driven by fundamental factors - demographic and productivity trends, inequality, along with the country's monetary policy and characteristics as a small open economy. This necessitates a more complex definition of the alternative stimulating or restrictive financial environment. Among the fundamental factors, demographic changes in Bulgaria due to high emigration, high mortality, and low birth rates over the past 30 years have led to an aging population, resulting in a higher savings rate and a lower rate of capital accumulation. Simultaneously, life expectancy in Bulgaria has also steadily increased—from approximately 70.9 years in 1998 to 75.6 years in 2024. Income inequality has also risen to persistently high levels, with the share of the top 10% of incomes reaching 44.2% in 2022 compared to nearly 36% in 1999 and much lower in previous decades. These factors suggest an increasing demand for safe and liquid assets. The gradual decline in productivity after the significant transformations at the beginning of the 21st century also exerts downward pressure on the natural interest rate, with total factor productivity growth having halved compared to the decade before the Global Financial Crisis. An additional factor contributing to the decline in rN* can be considered the strong "anchor" of expectations from the Eurozone through the channel of financial integration.

Robustness Check

In this section, the spread between the measured rN* and the data on the interest rate on newly business loans is compared to the traditionally used determinant of the *ex-post* real interest rate (Ivanov et al., 2018). This comparison is made to check the extent to which the measurement adequately corresponds to theory and whether it could improve the study of the determinants of interest-intensive aggregate demand, such

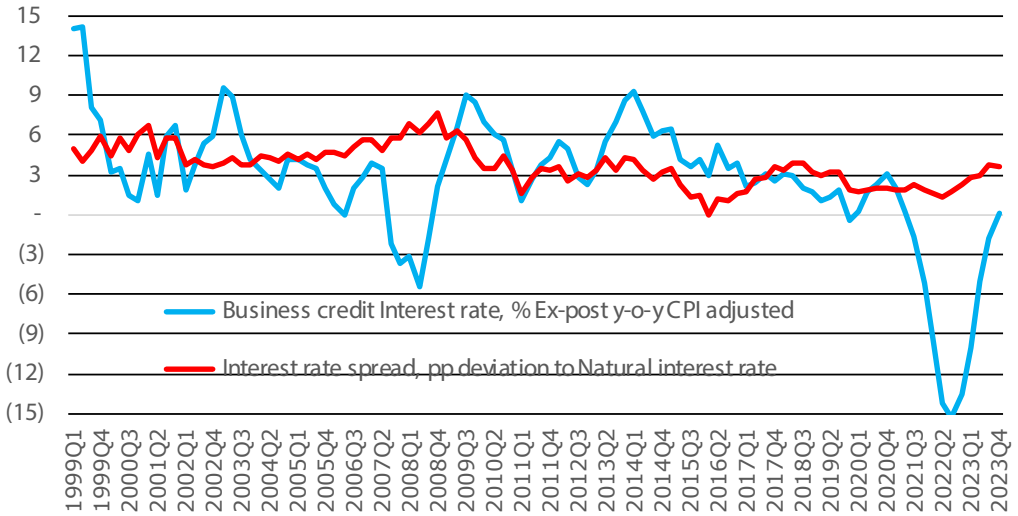

Figure 2. Real interest rate on new business loans and spread over the natural interest rate in Bulgaria 1999 – 2023

Source: own calculations

as private investments. For the analysis, variables are identified based on economic theory, after which their stationarity is tested. Non-stationary variables are transformed into stationary ones, while their sequence in the recursive identification of the model is formed based on the Wald test for exogeneity.

Significant discrepancies between the two measures and a notably large divergence around 2022 are observed, with more restrictive financial conditions in Bulgaria if following the spread between the interest rate and rN* and the opposite conclusion if using the real interest rate (Figure 2). From the perspective of investment activity, it can be said that the new approach here has its advantages. This is confirmed by checking the variance decomposition of shocks after estimating the SVAR model. After conducting simulations with different compositions of global and domestic variables, a model with four (4) variables was chosen, which largely corresponds to the characteristics of a small open economy like Bulgaria (see data description). Before proceeding to recursive structural factorization, the model was tested for autocorrelation and normality of residuals, with successful results for four (4) lags.

The proposed new approach has an impulse response to shocks that aligns with theoretical expectations and more successfully explains the variation in investments in the medium- to long-term—up to about 30% of the variation (Figure 3). In contrast, the real interest rate has sporadic explanatory power in the short term (about 10% of variance decomposition) which disappears in the long run. These results confirm that the theoretical concept of the long-term neutral interest rate can be applied to Bulgaria and that its measurement proves its practical significance for longer-term analysis horizons.

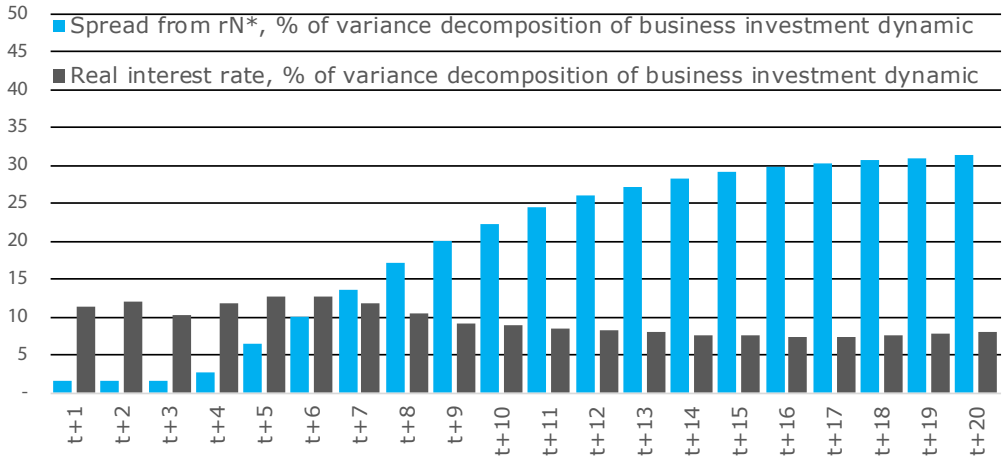

Figure 3. Variance decomposition of business investment growth rate using Structural VAR (quarterly basis), %

Source: own calculations

Implications of Results for Fiscal Policy

The decline in equilibrium real interest rates in recent years has made it more likely that economic policy will encounter the effective lower bound on short-term interest rates. Under these circumstances, fiscal policy becomes particularly impactful on economic activity and inflation. In the presence of major supply shocks—such as pandemics or climate emergencies—this influence of fiscal policy on inflation can be especially significant (IMF, 2023b). When it comes to stabilizing real economic activity, fiscal policy can be more targeted and effective than monetary policy tools (Bartsch et al., 2020).

Since the level of interest rates affects fiscal space, a lower rN* relative to nominal GDP growth (or their inflation-adjusted values) increases the opportunities for fiscal policy due to the "snowball effect" channel, all else being equal. Beev and Todorov (2019) address this issue by combining the fiscal reaction function (Bohn, 1998, 2007) with the necessary surpluses to maintain a constant level of indebtedness in an empirical assessment model for Bulgaria. Their research indicates that fiscal space in Bulgaria has significantly increased due to favorable government bond yields, but this space is not being utilized effectively. Their study does not focus on the factors behind these favorable conditions, which are expanded upon in the present research. The current research highlights the fundamental drivers contributing to the decline in the natural interest rate, such as demographic changes, increased savings rates, and lower capital accumulation, as well as the persistent increase in life expectancy and income inequality. These factors collectively enhance the demand for safe and liquid assets, reinforcing the downward pressure on the natural interest rate. Consequently, these conditions provide a more favorable environment for fiscal policy to act, especially when monetary policy is constrained by the lower bound on interest rates. This new

perspective underscores the importance of integrating the natural interest rate into fiscal policy analysis, thus enabling more effective and informed decision-making processes that align with the underlying economic conditions.

Over most years, the difference between GDP growth and the natural interest rate has been negative, aligning with the Blanchard (2023) hypothesis of insufficient aggregate demand. Most factors that impact on economic growth (inequality, population aging, productivity, etc.) are positively correlated with the natural interest rate, making it likely that the negative spread will persist for Bulgaria, despite the country's long-term growth trends being lower compared to past decades. The persistent negative spread suggests that Bulgaria may continue to experience conditions of insufficient aggregate demand, which can have profound implications for fiscal policy. This condition implies that even with a low natural interest rate, the economy might not achieve full employment or optimal output levels without additional fiscal intervention:

- **Enhancing fiscal space** - The negative spread between GDP growth and the natural interest rate indicates more room for fiscal maneuvering. Since borrowing costs are relatively low, the government has greater leeway to implement expansionary fiscal policies without jeopardizing debt sustainability. The favorable interest rate environment, combined with the low natural interest rate, suggests that Bulgaria can increase public investment or social spending to stimulate demand and support economic growth.
- **Targeted fiscal interventions** - Given structural challenges such as aging population and increasing inequality, fiscal policy should focus on long-term investments that can enhance productivity and support demographic transitions. This includes investments in healthcare, education, and infrastructure that can boost labor productivity and economic potential.
- **Counteracting insufficient demand** - To address the insufficient aggregate demand highlighted by the negative spread, fiscal policy should aim to stimulate consumption and investment. Measures could include tax cuts or direct transfers to lower-income households, which are more likely to spend additional income, thereby boosting demand.
- **Supporting structural reforms** - Fiscal policy should also support structural reforms that can increase the efficiency and competitiveness of the economy. This might include reforms in labor markets, regulatory frameworks, and measures to promote innovation and technological adoption.

Conclusion

In conclusion, the findings of this study provide insights into the interplay between the natural interest rate, private investment dynamics and fiscal sustainability in Bulgaria. The seminal findings are related to declining natural interest rate that reveals more precisely assessment of financial conditions and stability of the $r^* < g$ term (both not inflation-adjusted) for fiscal analyses. These findings rely on a simple theoretical model of transactional demand for money and empirical evidence of cointegration between the income velocity of money and interest rate. In this way, the natural rate of interest became a derivative of the observable (and high frequency) variables, which has its practical advantages, unlike other studies of the problem (based on the unobserved component approach).

Nevertheless, some challenges to the analysis also need to be mentioned. It is known that under Bulgarian currency board regime monetary policy rate is not applicable and risk-free government bond yields was used as an approximation rate because of a high correlation between them in industrialized countries (such as in Benati (2020)). Under this assumption permanent shifts in risk premium would be counted as a part of a natural interest rate. Although this assumption disturbs the measurement of the "pure" natural interest rate for monetary policy purposes, from the point of view of the currency board regime it cannot be considered so irrelevant. Another restrict of findings is focusing on the *nominal* natural interest rate rather than the inflation-adjusted or *real* rate, which does not allow for a direct comparison of private investment and the natural interest rate, but only through a study of financial conditions. The reason for resorting to this was related to data limitations and the specificity of the observed period, namely higher than usual inflation rates at the end of the period, which may bias the stationarity of CPI and accuracy of average (or targeted) inflation extraction to calculate r* from nominal estimation. Based on future data further work may produce solutions to the limitation.

The empirical analysis conducted in the second stage of this study delves into the determinants and variations of private investments in the Bulgarian economy, shedding light on financial conditions approximated by interest gap (difference between the market interest rate and natural interest rate and how its dynamic influences investment decisions). From descriptive data the ageing, higher income inequality and reduced productivity growth were identified as significant structural impact factors that indicate reducing the natural interest rate. Higher savings and lower productivity growth probably explain to the greatest extent why lower-than-average market interest rates do not mobilize strong and sustained private investment at the expected (by alternative theory, based on deflated, market interest rate importance) extent. After the global financial crisis, an additional wedge between risk-free government securities and corporate bonds may have emerged that is positively correlated with the decline in productivity (because of missing data on corporate-risk free spread is not included into the study). Risk aversion in the years of uncertainty, together with the limited supply of risk-free bonds by the Bulgarian government, may also explain the decline in the natural interest rate over time. By understanding these dynamics, policymakers can tailor their fiscal and monetary policies to support and encourage private investment, thereby stimulating economic growth and development even in the face of challenging macroeconomic conditions characterized by a persistently low natural interest rate.

By recognizing the implications of the downward trend in the natural interest rate, policymakers can devise strategies to navigate challenges and leverage opportunities for sustainable economic development. With most factors influencing economic growth positively correlated with the natural interest rate, the observed in Bulgaria r*<g condition is likely to persist for a longer duration. One of the key implications of the negative spread between the natural interest rate and economic growth is its impact on fiscal space. Fiscal space refers to the capacity of a government to borrow and spend in response to economic shocks or to meet policy objectives without jeopardizing fiscal sustainability. In the context of Bulgaria, the negative spread implies that

the cost of servicing public debt may remain relatively low compared to the nominal GDP. Considering the projections derived from this study, future economic governance in Bulgaria should focus on transforming fiscal policy to capitalize on the increased fiscal space afforded by the negative spread between the natural interest rate and economic growth. The research conducted by Beev and Todorov (2019) provides valuable insights into the dynamics of public debt sustainability in Bulgaria. The results highlight that Bulgaria enjoys a significant increase in fiscal space due to favorable returns on government bonds. However, despite this enhanced fiscal space, the government's utilization of available resources may not be optimal. Measures towards greater mobilization of savings into investments are necessary. Potential solutions could include increasing the share of public investments in government expenditures, ensuring alignment with challenges (i.e., promoting more investment rather than saving), intensifying the issuance of perceived safe government bonds, and reducing income and wealth inequality through a more progressive tax system.

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Appendix 1

A.1.1. Unit root tests

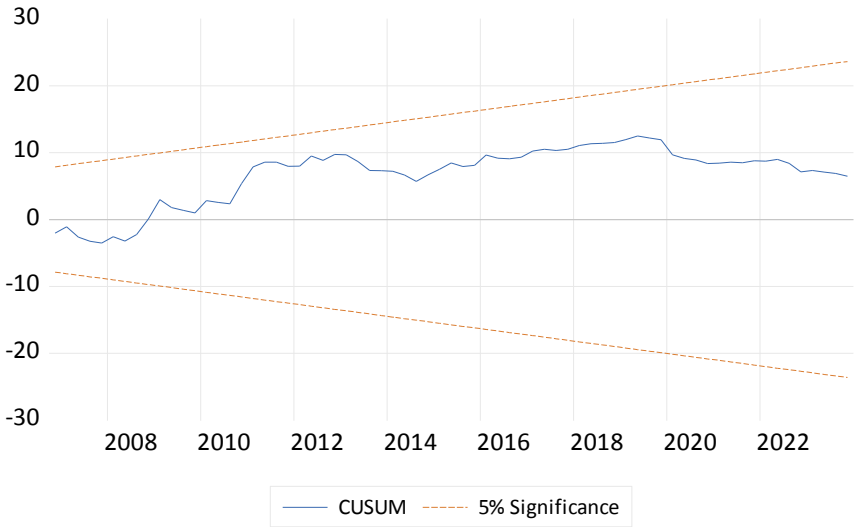
Variable		Income velocity of Money		Nominal interest rate (5y GB)	
		P-P	ADF	P-P	ADF
		At Level		At Level	
With Constant	t-Statistic	-2.9236	-1.7947	-1.8434	-1.6086
	Prob.	*0.0462*	*0.3809*	*0.3569*	*0.4729*
With Constant & Trend	t-Statistic	-3.3472	-2.8828	-2.8696	-1.9634
	Prob.	*0.0648*	*0.1731*	*0.1785*	*0.6107*
Without Constant & Trend	t-Statistic	-4.0908	-2.2319	-1.5944	-1.5405
	Prob.	*0.0001*	*0.0255*	*0.1039*	*0.1151*
		At First Difference		At First Difference	
With Constant	t-Statistic	-9.3552	2.6352	-13.3307	-12.3136
	Prob.	*0.0000*	*0.0898*	*0.0001*	*0.0001*
With Constant & Trend	t-Statistic	-9.6605	-2.8051	-13.5167	-12.2612
	Prob.	*0.0000*	*0.1995*	*0.0001*	*0.0001*
Without Constant & Trend	t-Statistic	-8.6590	-2.1242	-13.3000	-12.3579
	Prob.	*0.0000*	*0.0330*	*0.0000*	*0.0000*

A.1.2. F-statistics (Cointegration, ARDL)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)*	-0.052265	0.012378	-4.222309	0.0001

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.775234	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58

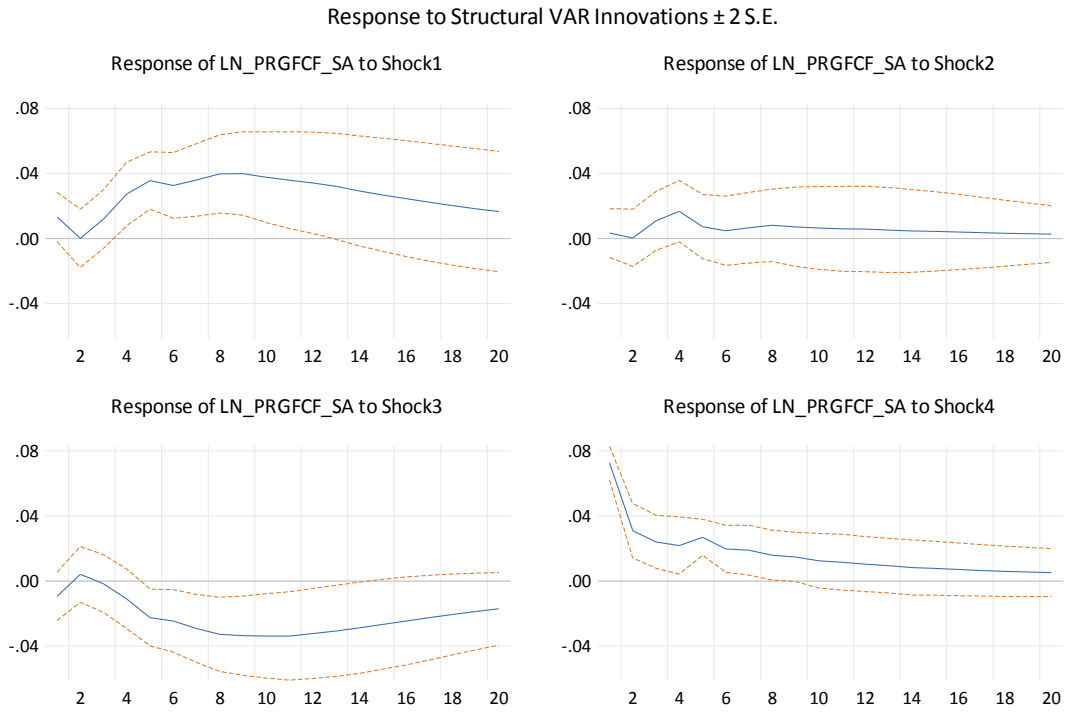
A.1.3. Stability test (CUSUM)



Appendix 2

A.2.1. Impulse response functions 4 variables SVAR

(FDI flow, Profits to GVA, Interest rate gap, Private GFCF)



A.2.2. Historical decomposition of Gross fixed capital formation growth rate by SVAR (scenario with Interest rate gap)