



INFLATION AND INCOMES POLICY UNDER A CURRENCY BOARD: THE BULGARIAN CASE

Ivan Todorov¹ 
Nikolay Patonov² 

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Abstract: *This study examines the relationship between nominal salary and inflation in Bulgaria under a currency board. A theoretical background of the connection between incomes policy and inflation is provided. Autoregression with distributed lag (ARDL) is employed to analyze the relationship between the percentage change of average nominal salary, the rate of inflation, and the percentage change of average real labor productivity. The time-series data include observations from the third quarter of 1997 to the first quarter of 2022. The study results indicate the existence of both short-term and long-term relationships between inflation and the nominal change in average salary. It is also found that the link between the changes in nominal salary and real labor productivity is broken both in the short and the long term.*

Keywords: *Bulgaria, Inflation, Incomes policy, Currency board arrangement.*

JEL Classification E31 · E64

✉ ivank.todorov@swu.bg

¹ South-West University "Neofit Rilski", 66 Ivan Mihaylov Street, 2700 Blagoevgrad, Bulgaria

² South-West University "Neofit Rilski", 66 Ivan Mihaylov Street, 2700 Blagoevgrad, Bulgaria



1. INTRODUCTION

In times of an accelerated increase in the price level, harnessing inflation and implementing adequate incomes policy become priorities of macroeconomic management. This is especially true for a small open economy in a currency board arrangement such as the Bulgarian one, which heavily depends on its overseas commercial and financial relations. It is also deprived of autonomous monetary and exchange rate policies and has the lowest per capita income in the European Union. Under the conditions of the COVID-19 pandemic and the war in Ukraine, the international prices of energy resources, raw materials, goods, and commodities go up and cause a substantial rise in domestic inflation, which reduces the purchasing power and the living standard of Bulgaria's population.

The goal of this study is to investigate the link between inflation and wages in Bulgaria under a currency board since the conduct of successful anti-inflationary and incomes policies requires a substantial and detailed understanding of this link. To achieve this goal, the following tasks are fulfilled:

- Examine the connection between inflation and incomes policy under a currency board from a theoretical standpoint (section two);
- Review and systematize relevant theoretical and empirical research on the nexus between inflation and incomes policy (section three);
- Empirically analyze the relationship between the percentage change of average nominal salary, the rate of inflation, and the percentage change of real labor productivity (section four);
- Formulate advisable anti-inflationary and incomes policy for Bulgaria under crisis conditions (conclusion).

In the empirical analysis, autoregression with distributed lag (ARDL) and quarterly seasonally, and calendar adjusted Eurostat data for the period 1997-2022 are employed. Following the trends in the empirical work on this topic, Granger tests are applied to further clarify the relations of interest and check the bilateral causality hypothesis. The paper is structured as follows. The first section provides a theoretical background of the link between inflation and nominal wage. The second section reviews the literature on inflation-salary nexus. The third section is an empirical analysis of the relationship between inflation and nominal salary in Bulgaria under a currency board. The last section makes a conclusion and recommendations for suitable incomes and anti-inflationary policies in Bulgaria.

2. THEORETICAL BACKGROUND

Classical central banks have three traditional monetary instruments to achieve price stability – the open market operations, the base interest rate, and the minimum required reserves on the deposits of commercial banks. Under the conditions of a currency board regime, the Bulgarian National Bank (BNB) is deprived of the first two instruments and is allowed to set the minimum required reserves only. However, the specific structure of the Bulgarian currency board implies a possibility for monetary impacts with fiscal means. Through changes in the amount of its deposit in the liabilities of the Issue Department of the BNB, the Bulgarian government can influence the rate of inflation in Bulgaria. Still, this influence, although statistically significant, is relatively weak (Todorov et al., 2020). The government's ability for monetary discretion by fiscal means is limited since the stability of the currency board requires strict fiscal discipline and a sound financial system (Nenovsky & Koleva, 2001). In strict terms, Bulgaria's currency board is a system of domestic currency issued under full coverage by convertible foreign currency. This is the primary

purpose of the board adopted in Bulgaria. Thus, the domestic currency is freely exchangeable and convertible into the reserve currency at a fixed exchange rate. A reserve currency must cover only base money (the narrowest monetary aggregate) of the currency board economy (Avramov, 1999).

Domestic currency issuing must be backed only by foreign currency assets that are free of the central bank's policy impacts. These assets however have a strong relation with the national balance of payments and capital flows in particular. Since currency issuing against domestic assets is prohibited, major sources of inflation have been eliminated (Avramov, 1999). Under such a system, monetary authority plays a passive role with regard to money supply (Avramov, 1999). Since the currency board makes the link between the balance of payments and the domestic money supply automatic (Ganchev & Todorov, 2021), inflation in Bulgaria is supposed to depend mainly on external factors (Alawin & Oqaily, 2017; Central Bank of Iceland, 2000). The peg of the Bulgarian lev to the Euro means that the main external determinant of monetary conditions in Bulgaria, including the rate of inflation, is the monetary policy of the European Central Bank (ECB). Other external factors affecting the price level in Bulgaria are the energy policy of the European Union (EU), the COVID-19 pandemic, and the military conflict in Ukraine, which led to an increase in the prices of energy resources, raw materials, and food products.

Inflation in Bulgaria is also impacted by structural factors such as the price convergence with the more developed economies in the Euro area (Patonov & Zhegova, 2019; Rogers et al., 2001; Stoykova & Paskaleva, 2018; Todorov & Stavrova, 2022; Todorov & Boneva, 2022), the changes in the relative prices of goods and services, the digital and green transformation of the economy and society and so on.

The rate of inflation in Bulgaria is influenced by internal factors too which should not be underestimated. Such internal factors are the amount of the fiscal reserve of the government, the size of the minimum required reserves on the deposits of commercial banks, the value of the peg of the Bulgarian lev to the Euro, the indirect tax rates, the payment of compensations to businesses for the increased energy prices, the incomes policy, etc. (Ganchev & Todorov, 2021; Ganchev et al., 2014; Nenovsky & Koleva, 2001; Stoilova & Todorov, 2021; Tanchev, 2021; Vladova & Pachedzhiev, 2008).

The fiscal reserve of the government and the minimum required reserves on the deposits of commercial banks are the tools through which the Bulgarian macroeconomic management can have a limited impact on inflation in the conditions of a currency board. The first instrument is non-traditional, derives from the specific design of the Bulgarian currency board, and is under the control of the government. The use of this instrument for monetary purposes is not advisable (Luis & Terrones, 2003). The second instrument is a traditional monetary tool of the central bank. An increase in the amounts of the fiscal reserve and the minimum required reserves should (at least in theory) lower the rate of inflation, but this would come at the expense of a decrease in the money supply, aggregate demand, and employment, which is not advisable.

The value of the peg of the Bulgarian lev to the Euro is part of the construction of the currency board and deserves special attention. According to expert estimates, the Bulgarian lev is undervalued compared to the euro by about 10-15% (Minassian, 2022). If these estimates are correct, this means an unsanctioned outflow of value from Bulgaria to the rest of the world, both on the current account and on the capital and financial account of the balance of payments. The simplest example is imports at higher prices than the real ones, which further accelerates inflationary dynamics in Bulgaria.

If the estimates of [Minassian \(2022\)](#) about the actual exchange rate of the Bulgarian lev to the Euro are precise, a switch from a fixed to a floating exchange rate would contribute to lower inflation in Bulgaria in two ways: first, the prices of external products, resources, and assets would be lower by 10-15% at an exchange rate of around 1.7 Bulgarian leva per Euro, than at the current rate of 1.96 Bulgarian leva per Euro; second, under a floating exchange rate, price convergence with the Euro area would occur at lower rates of inflation in Bulgaria than under a fixed exchange rate. The abandonment of the currency board provides opportunities for autonomous monetary and exchange rate policies, which can additionally help mitigate external shocks and manage price dynamics.

The rates of indirect taxes are related to the type of tax system, which in Bulgaria is extremely consumption-based. This means that indirect tax revenues exceed direct tax revenues several times. This structure of the tax system has extremely adverse social and economic effects ([Todorov, 2012](#)). Low proportional taxes on personal and corporate incomes increase inequality, while high indirect taxes raise the costs of production and the price level and reduce aggregate supply and aggregate demand. A complete reform in the Bulgarian tax system is recommended - an introduction of a non-taxable minimum income and progressive income taxation, as well as a reduction in the rates of indirect taxes. The goal is a shift from a consumption-based to a hybrid tax system, where there is a relative equality of direct and indirect tax revenues in the state budget. The hybrid tax system is more socially and economically efficient than the consumption-based tax system ([Tanchev & Todorov, 2019](#); [Todorov & Durova, 2020](#)).

Applicable as a time-limited measure, the government provides partial compensation to private enterprises for saving jobs during pandemic time as well as mitigating the effects of rapidly increased prices of fuels and electricity. Such measures were proposed by the government in hard periods for businesses to help more enterprises survive and keep their working and jobs relatively unchanged. It is important to note, there is a slight border between useful measures and populism. Nevertheless, the contemporary mechanism of compensating businesses for the increased energy prices is an administrative measure that is incompatible with the market economy and has the potential to distort market proportions. It would be difficult to agree on the anti-inflationary character of such a measure. It could be considered a pro-inflationary measure because it accumulates tensions in the economy, which may lead to an even higher future rise in prices. The businesses must increase the efficiency of their activities and cope with the price shock by themselves, without relying on aid and compensation from the state.

There is a two-way relationship between inflation and income. On the one hand, a rise in inflation lowers the purchasing power of incomes and a need appears for their nominal increase in order to compensate for the loss of purchasing power. On the other hand, an increase in incomes raises aggregate demand and price level (generates inflation). This bi-directional link requires an adequate formulation and a precise implementation of the so-called incomes policy (the policy of increasing pensions and wages).

It is recommended that two principles be followed in the incomes policy: first, for pensions, the nominal percentage change should be equal to the rate of inflation; second, for wages, the nominal percentage change should be a sum of the rate of inflation and the real percentage change in labor productivity. These principles apply at all economic levels – individual, firm, industry, region and national economy – and their violation can have severe social and economic consequences.

If the nominal percentage change in pensions is higher than the inflation rate and/or the nominal percentage change in wages is higher than the sum of the inflation rate and the real percentage

change in labor productivity, the interests of employers and the state budget are harmed and the following undesirable social and economic effects can be generated:

- Inflationary spiral “prices-wages”, the danger of “overheating” of the economy and increasing probability of recession;
- A decline in price (cost) competitiveness both at the micro level (individual firms) and at the macro level (national economy), which would hinder exports and economic growth;
- Deterioration of the financial situation and bankruptcies of companies;
- Increase in budget deficit and government debt.

If the nominal percentage change in pensions is lower than the inflation rate and/or the nominal percentage change in wages is lower than the sum of the inflation rate and the real percentage change in labor productivity, the interests of pensioners and wage earners are damaged. The possible negative social and economic consequences are a decline in the purchasing power of the vast majority of the population, emergence of social tension, decline in consumption and GDP, strengthening of social stratification and inequality, etc.

3. LITERATURE REVIEW

There are opinions in favor of the efficiency of the currency board in coping with high inflation and significant macroeconomic imbalances (Kiguel, 1999). The last one seems to be a broader macroeconomic goal for a political decision such as the adoption of a currency board. However, the currency board does not enjoy the popularity of a universal instrument for taming inflation. Far more governments turn to wage-price control to promote stabilization in periods of high inflation (Dornbusch & Simonsen, 1987).

It is important to note that currency boards, wage-price control, and other administrative policy approaches for keeping inflation within acceptable limits have temporary character and their success is restricted by the period of time and macroeconomic conditions. In this way, Argentina is referred to as the most famous case of a successful currency board, which collapsed after a decade of undoubted success (Frank, 2005; Spiegel, 1998). The decade after the collapse was a decade of rapid growth and recovery for Argentina's economy but also a period of sustainable high inflation, which reached 22.6% in 2008 (Salama, 2012). The growth in that period was accompanied by positive trends in real wages and labor productivity after 2003. At the same time, high-interest rates and tight discipline are blamed for the decreases in gross capital formation and income level in Argentina (Setiawan, 2003). The lessons drawn from Argentina's case do not seem to be in favor of adopting the system of currency board in Indonesia (Setiawan, 2003). The same surmise about Indonesia was shared by other economists (Spiegel, 1998). His reasoning stemmed from the fact that Indonesia is a large country with intensive foreign trade with other Asia countries. He also noted that ‘currency boards have worked in small emerging economies, such as Estonia and Bulgaria, where the creation of a credible fixed exchange rate regime was desirable’ (Spiegel, 1998).

Along with descriptive studies, many economists use econometric methods to examine the relations between inflation, wages, and labor productivity. They apply such procedures to single countries or samples of countries with similar macroeconomic conditions. Vector-autoregressive estimations and regression models with lags are popular among empirical economists (Bobeica et al., 2019; Dickens et al., 2006; Du Caju et al., 2009; Peneva & Rudd, 2017; Sbordon, 2002, 2005; Tatierska, 2010). GMM estimation can also be found (Gali & Gertler, 1999). Dickey-Fuller and Phillips-Perron unit root tests are often applied as supplementary statistical procedures for proving non-stationary dynamics and the need for de-trending time series used (Vasilev & Manolova, 2019). As the procedure

for estimating causal relations, the Granger test enjoys wide popularity as well. Granger-causality test applied has the potential to prove the exogenous character of the price level and its causal impact on labor costs or wages and vice versa (Hu & Toussaint-Comeau, 2010; Strauss & Wohar, 2004).

Empirical study on the Euro area found a Granger causality from labor cost to price inflation (Bobeica et al., 2019; Tatierska, 2010). What is more, they found the same causality remains strong over time (Bobeica et al., 2019) which contradicts the results of other empirical studies such as the VAR estimates on data for the United States that found a diminishing relation between labor costs and price inflation (Peneva & Rudd, 2017). The theoretical justification of the last result could be more solid in the short-run perspective. There are limitations with a market, institutional, or administrative character that have the potential to prevent fast adjustments and thus weaken the strong conceptual relation between price inflation and wages (Bidder, 2015; Bobeica et al., 2019; Campbell & Rissman, 1994; Daly & Hobijn, 2014; Edward et al., 2014; Hu & Toussaint-Comeau, 2010; Huh & Trehan, 1995). Market imperfections and short-term nominal wage rigidity are among the most cited factors that prevent fast adjustments between overall price levels and wages. Some confirmation of this logic is found in a low-inflationary macroeconomic environment (Mehra, 2000; Zanetti, 2007).

Granger causality in the opposite direction is established by Hu and Toussaint-Comeau (2010). They estimate the causal relationship between inflation to wages. Similar evidence was found by a wide set of empirical studies (Emery & Chang, 1996; Ghali, 1999; Sbordon, 2002; Schweitzer & Hess, 2000). Thus, Hu and Toussaint-Comeau (2010, p.53) assert that price inflation could be used for predicting changes in wages.

Another significant part of the evidence on the topic of interest is found by economists who study the relations at the industry level or in terms of data for various economic sectors (Bobeica et al., 2019; Du Caju et al., 2009; Tatierska, 2010). No doubt, these studies would find different kinds of relation at the industry level and total economy level (Bobeica et al., 2019; Dickens et al., 2006; Du Caju et al., 2009; Paskaleva, 2016; Tatierska, 2010).

As pointed out, evidence on the topic was drawn from both – cross-country studies and single-country case studies. The study of Zanetti (2007) is based on Swiss data. There are empirical studies on Bulgaria as an interesting case of a small open economy that has chosen a currency board regime. Stepping on survey data, Lozev et al. (2011) conclude about a weak price-wage relationship in Bulgaria. Other survey studies provided evidence in favor of the low percentage of businesses that consider the price-wage relation Vladova (2012). Having in mind these studies, Vasilev and Manolova (2019) concluded that ‘price-driven wage changes are not common in the case of Bulgaria’. Using survey data and probability regression, Paskaleva (2016) has drawn interesting conclusions about the relation between inflation and wages in Bulgaria for the period 2009-2013. She found that companies in worse economic conditions lower prices and labor costs more frequently. In this sense, macroeconomic conditions compel enterprises to look for adjusting labor input in both ways – by reducing employment and flexible wage components. The ultimate results of her study suggest that ‘wages and prices change relatively infrequently’ (Paskaleva, 2016). The comprehensive empirical study of Nenovsky and Koleva (2001) draws general conclusions about Bulgaria’s economy and labor market under a currency regime. It concludes about the industry level as well. The results of their regressions prove that ‘real wages are flexible in the following industries: commerce, hotels and restaurants, construction, paper and printing industries, food and tobacco industries, leather industry, real estate services, financial intermediation, manufacture of chemicals and their products’ (Nenovsky & Koleva, 2001). Among

their significant findings is that ‘private companies and entrepreneurship dominate the more flexible industries while state-owned companies dominate industries with rigid labor market’ (Nenovsky & Koleva, 2001).

4. EMPIRICAL ANALYSIS

This section focuses on the empirical study in the framework described above. It is intended to describe the methodology adopted, explain the specifics of the data used as well as present the regression results with corresponding discussion. A graphic presentation of the data would make it possible to draw separate conclusions on the trends and developments of each variable plotted.

4.1. Methodology

The general requirement for an efficient income policy is to keep the balance between wages and the real productivity of labor (Quinn, 1967). Disturbing this balance is assumed to have an impact on inflation. The following study is based on the assumption that ‘the rate of inflation increases with factor costs, and that productivity impacts positively on real wages but offsets price inflation’ (Downes et al., 1990). Within this framework, a simple regression model has been specified for the purposes of the present study. The relationship between inflation and wages in Bulgaria is investigated through an autoregression with distributed lag (ARDL), which includes the following variables:

CMPS_t – percentage change of average nominal compensation of employees in quarter **t** compared to the previous quarter;

INFL_t – inflation rate in quarter **t** (percentage change in the HICP in quarter **t** compared to the previous quarter;

LBPR_t – percentage change of average real labor productivity in quarter **t** compared to the previous quarter.

The target (dependent) variable is **CMPS**, while **INFL** and **LBPR** are independent (explanatory) variables. The regressions will be run along with the diagnostic statistics on the data.

4.2. Data

The database of Eurostat is used as a source of quantitative data on each variable of interest. Quarterly seasonally and calendar-adjusted Eurostat data from the third quarter of 1997 to the first quarter of 2022 are used in the study.

The quarterly dynamics of the average nominal salary, the rate of inflation, and the average real labor productivity in Bulgaria under a currency board arrangement are shown in Figure 1. As seen, the nominal salary sharply decreased between the third quarter of 1997 and the first quarter of 1999. This period was related to the initial reforms for economic liberalization and promoting financial stability. The initial reforms were conducted in terms of lower inflation that additionally prevents the nominal growth of the average salary. It was the period in which the gap between nominal and real income began tightening. The period of stability and low inflation rates was broken in the quarters of the worldwide financial crisis so the higher rates of inflation were replaced with higher rates of deflation. Stabilization was achieved after the second quarter of 2009. As a whole, these years were a period of economic recovery and fast development so the rates of growth were among the highest in the EU. Over the whole period, Bulgaria’s economy was successfully integrated with the European Economic Community and achieved excellent values of the indicators for public finance stability and Maastricht convergence criteria.

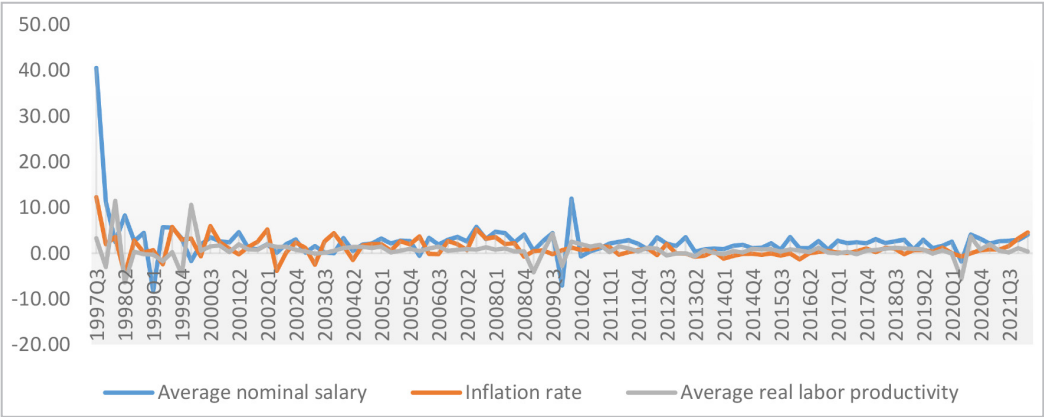


Figure 1. Dynamics of average nominal salary, inflation, and average real labor productivity (percentage change on the previous period) from the third quarter of 1997 to the first quarter of 2022

Source: Own processing; Eurostat

In Figure 2, the movement of the difference between the actual percentage change and the recommended percentage change of the average nominal is displayed. It may be inferred that with the exception of several quarters in crisis times, the actual percentage change of the average nominal salary is near (fluctuates around) the recommended percentage change of the average nominal salary. It is disturbing that during the last quarter of 2021 and the first quarter of 2022, the advisable percentage change of the average nominal salary is lower than the actual percentage change of the average nominal salary, which means that the purchasing power and the standard of living of wage earners are on the decline.

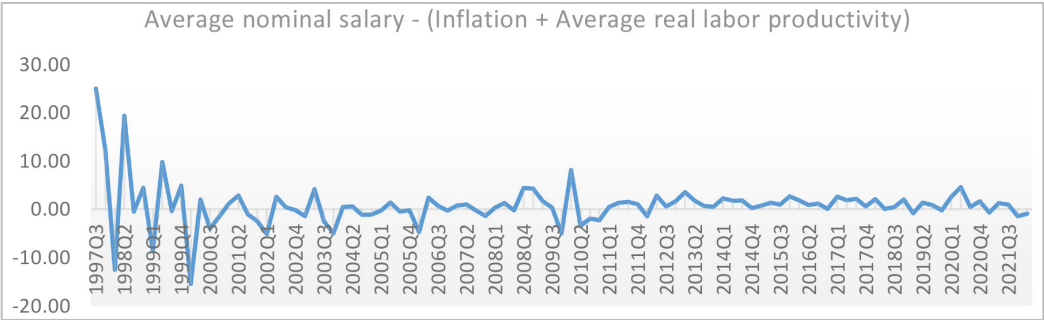


Figure 2. Dynamics of the difference between actual and advisable percentage change of average nominal salary in the previous period from the third quarter of 1997 to the first quarter of 2022

Source: Own processing; Eurostat

4.3. Results

The unit root tests (see Tables 1 and 2) show that **CMPS** and **LBPR** are stationary at level (integrated of order 0), whereas **INFL** is stationary at the first difference (integrated of order 1). The different order of integration of the variables requires the application of an ARDL.

Table 1. Augmented Dickey-Fuller Unit Root Test on the level values CMPS, INFL, and LBPR

Variable	Probability
CMPS	0.0000
INFL	0.3641
LBPR	0.0001

Source: Own processing**Table 2.** Augmented Dickey-Fuller Unit Root Test on the first differences of INFL

Variable	Probability
D(INFL)	0.0000

Source: Own processing

The test for the optimal number of lags in the ARDL indicates that according to the Hannan-Quinn information criteria, this number is one (see Table 3). The ARDL is estimated with one lag.

Table 3. Optimal lag length in the ARDL

Number of lags	FPE	AIC	SC	HQ
0	30.73539	11.93904	12.02182*	11.97244
1	26.23775	11.78066	12.11176	11.91424*
2	24.75340	11.72168	12.30111	11.95544
3	25.04693	11.73171	12.55947	12.06566
4	22.96990	11.64191	12.71800	12.07604
5	24.18412	11.68825	13.01266	12.22257
6	26.70155	11.77966	13.35239	12.41416
7	27.95842	11.81506	13.63612	12.54974
8	20.02940*	11.46738*	13.53677	12.30225

* Shows the optimal number of lags according to the respective criterion

Source: Own processing

The ARDL is expressed by the equation

$$D(\text{CMPS}) = C(1) + C(2) \cdot D(\text{CMPS}(-1)) + C(3) \cdot D(\text{INFL}(-1)) + C(4) \cdot D(\text{LBPR}(-1)) + C(5) \cdot \text{CMPS}(-1) + C(6) \cdot \text{INFL}(-1) + C(7) \cdot \text{LBPR}(-1) \quad (1)$$

The results from the econometric estimation of the ARDL are reported in Table 4.

Table 4. Results from the econometric estimation of the ARDL

Variable	Coefficient	Standard error	t-Statistic	Probability
C	2.509436	0.363102	6.911098	0.0000
D(CMPS(-1))	-0.064614	0.058217	-1.109884	0.2700
D(INFL(-1))	0.060787	0.135904	0.447277	0.6557
D(LBPR(-1))	-0.081191	0.126311	-0.642788	0.5220
CMPS(-1)	-1.233122	0.112482	-10.96286	0.0000
INFL(-1)	0.146705	0.194548	0.754078	0.4528
LBPR(-1)	0.053562	0.205487	0.260658	0.7950

Source: Own processing

The value of the coefficient of determination (R-squared = 0.69) implies that 69% of the variation of the average nominal salary in Bulgaria can be explained by changes in the independent

variables in Equation (1). The probability of the F-statistic (0.00) indicates that the alternative hypothesis of adequacy of the model used is confirmed. It should be made clear that this does not mean that the model is the best possible, but simply that it adequately reflects the relationship between the dependent and the independent variables.

The residuals in the ARDL are non-heteroscedastic and serially uncorrelated (see Tables 5 and 6), while the ARDL is dynamically stable (see Figure 3).

Table 5. Results from the serial correlation test on the residuals in Equation (1)

F-statistic	2.75	Probability F(1,89)	0.10
Observations R-squared	2.91	Probability Chi-Square(1)	0.09

Source: Own processing

Table 6. Results from the heteroscedasticity test on the residuals in Equation (1)

F-statistic	0.32	Probability F(6,90)	0.93
Observations R-squared	2.02	Probability Chi-Square(6)	0.92

Source: Own processing

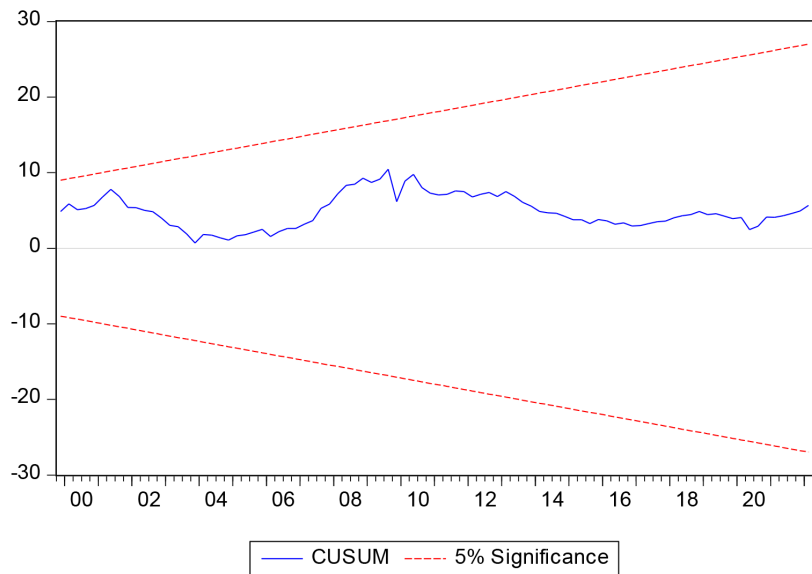


Figure 3. CUSUM test for dynamic stability of the ARDL

Source: Own processing

The ARDL bounds test (see Table 7) provides evidence of the existence of a long-run relationship between the variables in the ARDL, which requires the estimation of an error correction model (ECM).

Table 7. ARDL bounds test

Null Hypothesis: C(5)=C(6)=C(7)=0			
Test Statistic	Value	Degree of freedom	Probability
F-statistic	46.52975	(3,90)	0.0000
Chi-square	139.5893	3	0.0000

Source: Own processing

The ECM has the form

$$D(\text{CMPS}) = C(1) + C(2) \cdot D(\text{CMPS}(-1)) + C(3) \cdot D(\text{INFL}(-1)) + C(4) \cdot D(\text{LBPR}(-1)) + C(5) \cdot \text{ECT}(-1) \quad (2)$$

The results from the econometric estimation of the ECM can be seen in Table 8.

Table 8. Results from the econometric estimation of the ECM

Variable	Coefficient	Standard error	t-Statistic	Probability
C	-0.027549	0.219107	-0.125731	0.9002
D(CMPS(-1))	-0.298344	0.069377	-4.300358	0.0000
D(INFL(-1))	0.257660	0.097269	2.648958	0.0095
D(LBPR(-1))	-0.096843	0.065398	-1.480824	0.1421
ECT(-1)	-1.071425	0.124351	-8.616151	0.0000

Source: Own processing

The regression coefficient before the error correction term (ECT) is statistically significant and negative, which implies the existence of a long-run equilibrium relationship between the dependent variable and the independent variables in the ECM. The absolute value of this coefficient – 1.07 – means that each deviation from the long-term equilibrium is eliminated at a rate of 107 percent per quarter.

The short-run regression coefficients before D(CMPS(-1)) and D(INFL(-1)) are also significant, which suggests that in the short run, the percentage change of average nominal compensation of employees in Bulgaria is affected by its past values and the previous values of inflation. The short-term regression coefficients before D(INFL(-1)) are positive, which is in agreement with theoretical expectations. Its value of 0.26 indicates that a ceteris paribus 1% change in the rate of inflation will lead to a 0.26% change in the rate of change of the average nominal salary three months later.

The value of the coefficient of determination of the ECM (R-squared = 0.70) means, that 70% of the variation of the percentage change in the average nominal salary in Bulgaria can be explained by changes in the independent variables in Equation (2). The probability of the F-statistic (0.00) implies that the alternative hypothesis of adequacy of the model used can be accepted. This does not mean that the model is the best possible but simply indicates that it adequately reflects the relationship between the dependent and the independent variables.

The residuals in the ECM are non-heteroscedastic and serially uncorrelated (see Tables 9 and 10), while the ECM is dynamically stable (see Figure 4).

Table 9. Results from the serial correlation test on the residuals in Equation (2)

F-statistic	0.19	Probability F(1,90)	0.67
Observations R-squared	0.20	Probability Chi-Square(1)	0.66

Source: Own processing

Table 10. Results from the heteroscedasticity test on the residuals in Equation (2)

F-statistic	0.66	Probability F(4,91)	0.62
Observations R-squared	2.71	Probability Chi-Square(4)	0.61

Source: Own processing

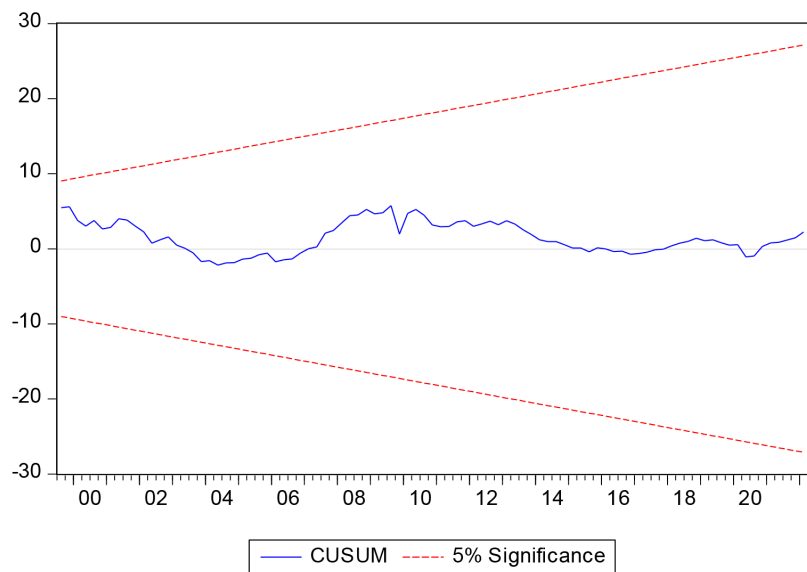


Figure 4. CUSUM test for dynamic stability of the ECM
Source: Own processing

The results from the Granger Causality Tests show that both in the short term and the long run, the percentage change of the average nominal salary in Bulgaria is Granger-caused by the rate of inflation but not by the percentage change in the real labor productivity (see Tables 11 and 12).

Table 11. Results from short-term causality tests

Independent variables	Probability
INFL	0.0090
LBPR	0.8305

Source: Own processing

Table 12. Results from long-term causality tests

Independent variables	Probability
INFL	0.0066
LBPR	0.5445

Source: Own processing

5. CONCLUSION

As understood, the adoption of the currency board started a period of nearly two decades of economic recovery, reforms, development, and the successful integration of Bulgaria’s economy with the European Economic Community. It was marked by relatively low rates of inflation and rapid growth of the average salary and labor productivity. The paper regressed inflation, nominal wage, and labor productivity to study the short-term and long-term relationships and causalities among these variables.

The empirical results suggested no connection between nominal salary and real labor productivity in the short and long-term perspective. This result could be interpreted as an indication of two serious problems in Bulgaria’s labor market: first, employers do not reward labor productivity gains,

and second, employees do not increase their productivity in response to rises in nominal wages. The existence of those problems would be evidence that the labor market is inefficient and hamper economic growth.

It is important to note, that the result of the study has not exhausted all the considerations on the topic of interest. Their most valuable contribution is the rise of discussion and attracting the attention of economists and policymakers. Nevertheless, taking into account the discussion and its future developments, Bulgarian policymakers must focus their efforts on restoring the broken link between wages and labor productivity.

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