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Effects of budget deficit and money supply on inflation: empirical evidence from the Republic of North Macedonia

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Abstract:
***Background*:** *A sustainable high growth rate of the gross domestic product with low inflation is one of the major objectives of most macroeconomic policies. Therefore maintaining price stability plays an important role in determining the growth rate of production.The key objective of this paper is to investigate the effect of budget deficit, narrow money supply M1, gross domestic product, government expenditures and real exchange rate on inflation in the Republic of North Macedonia in the period from2005Q1 to 2021Q4.*
Materials and methods:*The study employs quarterly data for the period 2005 to 2021. Data on government expenditures (GEXP) which were used to measure budget deficit are obtained from Ministry of Finance, while data on CPI which was used to measure inflation, gross domestic product, interest rate, money supply (M1) and real exchange rate are obtained from the National Bank of Republic of North Macedonia.The study uses cointegration and vector error correction model (VECM), as well as the pairwise Granger causality for the analysis. Results of the Granger causality test reveal that inflation Granger causes money supply in the Republic of North Macedonia at a conventional level of significance. On the other hand, no feedback effect is observed.*
Results:*The results from the Johansen cointegration test showed the existence of a positive and statistically significant long run relationship between the series, and the results of the VECM reveal that money supply causes inflation in the Republic of North Macedonia only in the long run. In addition, in the Republic of North Macedonia, budget deficit affects inflation directly and indirectly through fluctuations of interest rate and real exchange rate.*
Conclusion*:Therefore, the key implications for this study are that inflation in the Republic of North Macedonia is caused entirely by monetary factors, so the key measures are required to be undertaken in the monetary, as well as exchange rate policies to deal with inflation.*
***Keywords*:** *Budget deficit, Money supply, Inflation, Granger causality, Vector error correction model*

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I. Introduction

One of the main objectives of monetary policy pursued by Central Banks in the entire world is to maintain price stability (Ekanayake 2013). Understanding inflationary dispositions and their determinants is therefore a fundamental issue and attracts the interest of policymakers and monetary authorities. The budget deficit is studied for the Republic of North Macedonia, as it could theoretically be a source of inflation especially given how it is financed. In both the Keynesian and monetarist frameworks, deficits tend to be inflationary. This is because in the former case, budget deficits stimulate aggregate demand, while in the latter, when monetization occurs, it leads to an increase in the money supply, and ceteris paribus, increases the inflation rate in the long run (Gupta 2013). A positive shock on the government expenditure side is expected to result in a response on the supply side. However, if the increase in government expenditure generates demand pressure, this can cause inflationary tendencies.

However, evidence from empirical studies provides mixed results. A study by Catao and Terrones(2006) reveals a strong relationship between inflation and budget deficits in emerging economies distinguished by episodes of high rates of inflation and weak relationship in developed countries. They point out that budget deficits cause higher inflation rates for countries where the inflation tax base is lower and that less impact is felt in countries that have greater levels of monetization.

A study by Habibullah et al. (2011) on developing Asian countries find that, in the long run, budget deficits have inflationary tendencies in developing countries. This consideration is based on fact that many developing countries rely on the Central Banks for financing their deficits through printing money, which may be expected to result in greater excess aggregate demand compared with increased aggregate supply. In Sri-Lanka, Ekanayake (2013) reveals a weak relationship between the budget deficits and inflation. The relationship becomes stronger as the share of public expenditure allocated to wages increases. This implies that the

relationship between inflation and deficit is not only monetary phenomenon, but that public sector wage expenditures are also influential in the connection inflation and budget deficits.

Evidence from empirical studies for Pakistan showed mixed results. Namely, studies by Shabbir and Ahmed (1994) find a positive and significant relationship between budget deficits and inflation and indirect relationship between budget deficits and money supply. Therefore, they further argue that inflation is not only related to the budget deficit, but that the deficit is primarily financed through bank borrowing and eventually seigniorage. The study by Mukhtar and Zakaria (2010) reveal the absence of significant relationship between inflation and budget deficits in the long run.

Some researchers, do not find a significant evidence of the direction of causality between inflation and the budget deficit (Vieira 2000;Akcay et al. 2001), which implies that neither inflation nor budget deficit Granger causes the other.

In the Republic of North Macedonia, less effort has been devoted to studying the relationship between the budget deficit and inflation despite the fact that the country has had a budget deficit for years. This has beenattributed to the low revenue mobilization compared to rising expenditure requirements. For example, as a result of pandemic, as an unexpected global shock from the beginning of 2020, the realized budget deficit in 2020 recorded a significant increase and amounted to 8.1% of GDP, compared to 2019 whenthe realized budget deficit was 2% of GDP. Namely, in 2020, total budget revenues was at 28.6% of GDP compared to the expenditure requirements of 36.7% of GDP in the same period. Income from direct and indirect taxes fell, compounded by VAT reductions and deferred tax payments as part of the government's relief measures. On the expenditure side, the government increased spending on the health sector and on statutory transfer payments.The few studies that have been conducted have provided mixed results for the Republic of North Macedonia. For example, JehonaMusliu and AsllanMusliu (2017) examined the empirical relationship between inflation and budget deficit in the Republic of North Macedonia using quarterly data for the period 1993-2015. From the results obtained from the Granger causality test, it can be concluded that Granger causation in the short term has neither the budget deficit on inflation nor the inflation in the budget deficit. As for the impact among other variables, it is seen that interest causes inflation grants, budget deficit causes granger interest, and also inflation causes granger interest. So, mutual discrepancy is seen between the interest rate and the inflation rate, which speaks of a good monetary policy management over this period. Through the Granger test of causality, can be noticed that only short-term interest rates have an impact on inflation, while public debt and GDP do not have an impact on inflation. Therefore, the study showed that there is no impact from expansionary fiscal policy to inflation in the short run.

In other related study, (Durguti et al.),the authors have analysed the propositions of the explanatory variables and budget deficit, and the way they impacted the rate of inflation in Western Balkans Countries for a period from 2001 to 2017, where the unemployment rate, the real exchange rate, government debt and budget deficit were the independent variables, while the inflation rate was the dependent variable. The results obtained from the long-run relationship reveal that inflation rate positively and significantly relates to government debt and budget deficit, while in Western Balkans Countries, the inflation rate negatively and significantly relates to the real exchange rate. As to government debt linkage to the inflation rate, the results show that increasing the point of government debt affects inflation growth.

The main objectives of this study are to examine the long run relationship among inflation, money supply and budget deficit in the Republic of North Macedonia and to detect the direction of causality among these variables.

II. Literature Review

In the economic literature, numerous studies have been conducted to analyse the long run relationship among inflation, money supply and budget deficit. The evidence from the empirical literature showed mixed results. De Haan and Zelhorst (1990) investigated the relationship between budget deficit and money growth in developing countries. The conclusion of this study does not support the hypothesis that government budget deficit causes monetary expansion which leads to inflation.

Jeitziner (1999) examined the relationship between fiscal deficits and growth rates of the monetary base and the narrow money supply M1 in Switzerland and found that the narrow money supply did not move together with budget deficits and budget deficits lead to faster growth rates of the monetary base.

Mukhtar and Zakaria (2010) argue that the increase in inflation is observed due to high budget deficits with persistence, which cannot be prevented by monetary policy alone. However, such a hypothesis is not supported by empirical evidence. On the contrary, empirical findings show that in the long run the budget deficit is not related to inflation. On the contrary, it is related to the growth of money, and the budget deficit has no relationship as a cause and effect to the supply of money.

Barnhartand Darrat(1988) examined the causal link between budget deficit and money growth in seven OECD countries using multivariate Granger causality tests combined with Akaike's information criterion (AIC)

and Zelner's iterative seemingly unrelated regressions. The results from their study showed that the monetary and fiscal policies were independent in OECD countries and budget deficits had little or no impact on money growth.

Burdekin and Wohar (1990) examined the relationship between budget deficits and money growth in eight countries (Canada, France, Italy, Japan, Switzerland, the United Kingdom, USA and West Germany) in the period 1960Q1–1985Q4 and concluded that countries whose central banks are independent exhibit a poor link between fiscal deficits and the evolution of the money supply. This finding suggests that the level of central bank independence determines the effect of budget deficits on money supply growth.

According to Walsh (2003), the high correlation between inflation and the growth rate of money supply supports the quantity-theoretic argument that the growth of money supply leads to an equal rise in the price level.

Oomes and Ohnsorge (2005) examined the impact of money demand on inflation on monthly basis, from April 1996 to January 2004 by using the error correction model. The results from the study revealed that an excess supply of effective broad money supply is inflationary while other measures of excess money are not and that the effective growth of the money supply has the strongest and most persistent effect on short-term inflation.

The study used by Catao and Terrones (2001) showed that the demand for goods is based on expected present value of the future taxes.Budget policy can affect the price level through changes in aggregate demand; it should change the expected value of future taxes, which happens by changing the sounding.In this sense, budget deficits and taxation have similar effects on the economy, hence the expression "Ricardian theorem equivalence". That is, there is no change in national savings, since an increase in private savings is faced with an equivalent decrease in public savings. Since national savings, investments and aggregate demand do not change, it can be argued that the budget deficit does not affect the price level.

Same as the theoretical evidence, the evidence from the empirical literature on the direction of causality is also indecisive. Some studies have found a unidirectional relationship running from the budget deficit to inflation and vice versa. While others have found a bidirectional relationship and some studies found no relationship between these two variables. Some have found a unidirectional relationship running from the budget deficit to inflation, and they support the traditional approach to budget policy (Catao and Terrones 2001; Hamburger and Zwick 1981). However, most of these studies used single equation models where inflation is treated as an endogenous variable and the budget deficit as an exogenous variable using the ordinary least squares (OLS) estimation technique.

However, such an approach excludes the possibility of bidirectional causality. Recent studies by Ndanshau (2012) and Ekanayake (2013) used the cointegration and error correction model (ECM) but also concentrated on whether the budget deficit leads to inflation and ignored the feedback aspect that can be made by making inferences using short-run and long-run Granger causality within the VECM model. These findings are the basis of analysis in this study.

III. Theoretical framework

The theory behind the relationship between budget deficits and inflation may be explainedusing the Keynesian and the Monetarist frameworks. The Keynesian approach states that budget deficits are inflationary because they stimulate aggregate demand, while Monetarists indicate that budget deficits are inflationary because they cause money supply growth.

The theoretical framework adopted in this study is established on the findings of Solomon and Wet (2004) and Bwire and Nampewo (2014).Namely, Bwire and Nampewo (2014) in their study for the case of developing country like Uganda revealed that the main sources of budget financing, excluding grants, are summarized in Eq. (3.1). Grants are excluded because they are not reliable sources of government revenue; grants solely depend on donor discretion, and as a result, present potential risks of financial vulnerability.

$$G_t + \frac{D_{t-1}}{P_t}[1 + r_{t-1}] = T_t + \left(\frac{M_t - M_{t-1}}{P_t}\right) + \frac{D_t}{P_t} + \Delta R \quad (3.1)$$

Where, G_t is total government expenditure, $\frac{D_{t-1}}{P_t}[1 + r_{t-1}]$ is the discounted value of the real stock of accumulated government debt in the previous period with maturity value in the current period (t), T_t is tax revenue, $\frac{M_t - M_{t-1}}{P_t}$ is the change in money supply (or seigniorage revenue), $\frac{D_t}{P_t}$ captures domestic and external borrowing in the current period, while ΔR is the change in reserves.

This specification follows that used by Catao and Terrones (2001) and is widely supported in the literature on the conventional scaling of the budget deficit to GDP. According to Catao and Terones (2001), the scaling of the budget deficit by the money supply is theoretical sound, and would measure the infation tax base and include the non-linearity factor in the specification. Accordingly, this study adopted the conventional

measure of scaling the budget deficit by GDP. Rearranging Eq. 3.1 in relation to the budget deficit considering the purpose of study, the final estimation model is expressed in Eq. 3.2.

$$\pi = \left(\frac{FD}{m}, GDP, M1, IR, REXR\right) \quad (3.2)$$

Where, $\pi = \text{Inflation}, \text{GDP} = \text{Gross Domestic Product}, \text{M1}$ = Narrow Money Supply, IR=Interest Rate, REXR=Real Exchange Rate. In this study, Consumer Price index (CPI) denote π as a measure of inflation, budget deficit as a percentage of GDP Rq. 3.2. was transformed into the following:

$$\text{CPI} = f(\text{BD, GDP, M1, IR, REXR}) \quad (3.3)$$

IV. Empirical methodology

The study adopts the vector error correction model (VECM) established by Johansen (1988) and Granger causality test (Granger, 1969) to test the hypothesis regarding the relationship among budget deficit, money supply and inflation. A basic prerequisite for using the VECM model is the checking of the stationarity properties of the variables considered in the study to avoid inconsistent and unreliable results. The VECM is applicable when the series are integrated of order one [I (1)] (or at first difference), and there is a long-run relationship (cointegration) among the variables. In determining the stationarity properties of the series, the parametric Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979, 1981) and the non-parametric Phillips and Perron (1988) were used. In these tests, the null hypothesis of a unit root (non-stationarity) is tested against the alternative hypothesis of stationarity (no unit root). Rejecting (not rejecting) the null hypothesis confirms that the series is stationary (not stationary) within the sample period. After establishing the stationarity properties of the series, the cointegration test of the variables is tested using the Johansen cointegration test introduced by Johansen and Juselius (1990), which provides two test statistics—a trace test statistic and a maximum eigenvalue in order to decide whether there is a long-term relationship among the variables. The null hypothesis of no cointegration is rejected when the trace or maximum eigenvalue statistics exceed the 5% significance level. In this study, the optimal lag selection is chosen using the Schwarz-Bayesian Criterion (SBC). According to Pesaran (2015), SBC provides a more decent model specification and is more appropriate for a relatively smaller sample size.

After confirmation of a valid long-term relationship among the variables, the study first assesses the direction of causality between the variables using the pair-wise Granger causality test. The vector error correction model (VECM), which can produce a long-term relationship among the variables, is then estimated after the causality test to confirm the validity of the relationship, as well as the exact impact of the explanatory variables on the dependent variable. Equations (4.1) and (4.2) are the general and individual variable specification of the vector error correction model, respectively.

$$\Delta 1muX_t = \prod^{1mu} X_{t-1} + \Gamma_1 1mu\Delta 1muX_{t-1} \dots\dots\dots\dots + \Gamma_{\rho-1} 1mu\Delta 1muX_{t-1+1} + u_t \quad (4.1)$$

Where X_t is an m x 1 vector of first difference variables (inflation, money supply, budget deficit, real income, interest rate and real exchange rate), $\Gamma's(1, 2, \dots . \rho - 1)$ and $\prod$denote the short-run and long-run parameters of the respective variables and $u_t$is the error term. The notation, $\prod=\alpha\beta'$, α and β are 6 x r matrices that denote the short-run to long-run adjustment coefficients and the cointegration vectors among the variables.

The whole form of the vector error correction model (VECM) in the equation is, therefore expressed as follows:

$$\Delta\ln INF_t = \alpha_0 + \sum_{i=1}^{k-1} \beta_i \Delta\ln INF_{t-1} + \sum_{i=1}^{k-1} \phi_i \Delta\ln BD_{t-1} + \sum_{i=1}^{k-1} \tau_i \Delta\ln GDP_{t-1} + \sum_{i=1}^{k-1} \omega_i \Delta\ln M1_{t-1} + \sum_{i=1}^{k-1} \theta_i \Delta\ln IR_{t-1} + \sum_{i=1}^{k-1} \delta_i \Delta\ln REXR_{t-1} + \gamma_1 ECT_{t-1} + \varepsilon_{1t} \quad (4.2)$$

where all the variables are as explained earlier, Δ represents first difference operator, ECT is the error correction term and γ's (1) is the short-run coefficient of the error correction term, which lie within 0 and 1 and must be negative and significant. The β, ϕ, τ, ω, θ and δ represent the coefficients of the respective variables.

V. Results and discussion

This section discusses the empirical results of the study. The part begins with a summary of descriptive statistics of variables, trends in inflation, budget deficit and money supply (key study variables), followed by an analysis of stationarity properties of the series. After that, cointegration test, pairwise Granger causality test, normalized long run results and vector error correction results are discussed accordingly.

5.1. Descriptive and correlation analysis

The study employs quarterly data for the period 2005 to 2021. Data on government expenditures (GEXP) which were used to measure budget deficit are obtained from Ministry of Finance, while data on CPI which was used to measure inflation, gross domestic product, interest rate, money supply (M1) and real exchange rate are obtained from the National Bank of Republic of North Macedonia.

From Table 1, it is observed that money supply (M1), budget deficit (GEXP) and inflation (CPI) have mean (standard deviation) values of 13.08 (7.56), 42.04 (11.76) and 1.9(2.32), respectively. The maximum (minimum) values for money supply (M1), budget deficit (GEXP) and inflation (CPI) are 3.32.92 (-4.14), 74.59 (22.77) and 9.94 (-2.11), respectively. Also, the table 1 showed that the money supply (M1) has a normal skewness and mesokurtic because 3.17 = 3, budget deficit (GEXP) has a normal skewness and mesokurtic because 3.02 = 3 while inflation (CPI) has a long run tail (positive skewness) and leptokurtic because 5.51 > 3. Furthermore, the values of Jarque-Bera showed that the data for GEXP and M1 are normally distributed.

Table 1. Descriptive statistics

	CPI	**GDP**	**GEXP**	**IR**	**M1**	**REXR**
Mean	1.896422	2.759302	42.04224	4.040147	13.07886	61.48338
Median	1.38	2.8	40.8315	4.25	12.65741	61.52
Maximum	9.936667	13.44308	74.588	7.5	32.91794	61.7
Minimum	-2.11	-16.3915	22.766	1.09	-4.14201	61.17
Std. Dev.	2.322757	4.327589	11.75906	1.940533	7.560128	0.165706
Skewness	1.354293	-0.88806	0.498085	0.106666	0.275355	-0.71614
Kurtosis	5.505866	7.578747	3.021428	1.705654	3.174101	2.307652
Jarque-Bera	38.57812	68.33857	2.812968	4.87572	0.945182	7.170573
Probability	0	0	0.245003	0.087348	0.623385	0.027729

Source: Authors compilation obtained by Eviews

Table 2. The Matrix of Pearson Correlation Coefficients

Variables	LCPI	LGDP	LGEXP	LIR	LM1	LREXR
LCPI	1					
LGDP	0.153022 0.3214	1				
LGEXP	-0.169431 0.2716	-0.21554 0.16	1			
LIR	0.22368 0.1444	0.143962 0.3512	-0.79088 0	1		
LM1	0.123566 0.4242	0.155662 0.313	0.04945 0.7499	-0.21795 0.1553	1	
LREXR	-0.193743 0.2076	-0.30888 0.0413	0.639858 0	-0.43951 0.0028	-0.37012 0.0134	1

Source: Authors compilation obtained by Eviews

Multicollinearity test results

The correlation matrix presented in Table 2 describes the statistical correlation between inflation, gross domestic product, budget deficit, interest rate, money supply and the real effective exchange rate. The results presented in Table 2 clearly show that the pair of budget deficit (government expenditures) and interest rate has the biggest coefficient (0.79088). According to the study by Evans (1996), the level of correlation between them is relatively strong, while others coefficients of correlation are moderate and weak. However, for the time series of finance, the coefficient of correlation that is less than 0.8 is acceptable.

Table 3. Fisher type unit root test

Variables	ADF test		PP test	
	Level	First difference	Level	First difference
LCPI	-3.4723**	-7.1493***	-3.5188**	-7.1518***
LGDP	-4.609***	-8.103***	-4.6494***	-9.4***
LGEXP	-0.4239	-5.3859***	-1.9057	-29.952***
LIR	0.8546	-3.6647***	0.8891	-6.0151***
LM1	-3.0362**	-9.6356***	-3.0974**	-9.5279***
LREXR	-2.9273**	-7.1849***	-2.6268*	-31.6453***

Source: Authors compilation obtained by Eviews
(*)Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1% and (no) Not Significant

Table 3 presents the estimates of the unit root tests, such as The Augmented Dickey – Fuller (ADF) and the Phillip – Perron test of each variable, which were conducted both at level and first difference of the variables. The results of the ADF test and PP test showed that all the variables used in the analysis are stationary in first differences. This implies that the inflation, budget deficit, GDP, interest rate, M1 and real exchange rate are integrated in order one [i.e. I (1)].

Table 4. Johansen's cointegration test results

Hypothesized No. of CE (s)	Eigenvalue	Trace Statistic	0.05 Critical value	Prob.**
a) Unrestricted cointegration rank test (trace)				
None *	0.460545	108.0364	95.75366	0.0055
At most 1	0.342022	67.91868	69.81889	0.0702
At most 2	0.281162	40.7107	47.85613	0.1981
At most 3	0.149137	19.25296	29.79707	0.4748
At most 4	0.122692	8.755192	15.49471	0.3885
At most 5	0.003791	0.246854	3.841466	0.6193
Hypothesized no. of CE (s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical value	Prob.**
b) Unrestricted cointegration rank test (maximum eigenvalue)				
None *	0.460545	40.1177	40.07757	0.0495
At most 1	0.342022	27.20798	33.87687	0.2524
At most 2	0.281162	21.45774	27.58434	0.2495
At most 3	0.149137	10.49777	21.13162	0.697
At most 4	0.122692	8.508337	14.2646	0.3294
At most 5	0.003791	0.246854	3.841466	0.6193

Source: Authors compilation obtained by Eviews
Trace test indicates 1cointegratingeqn(s) at the 0.05 level
Max-eigenvalue test indicates 1cointegratingeqn(s) at the 0.05 level

The study proceeds with testing for cointegration using Johansen's cointegration test to the variables in order to ascertain whether the analysed variables were cointegrated. The Johansen's cointegration test was used in our study because it identifies the rank of number of cointegrating relations, as opposed to Engle Granger methodology which accepts only one cointegrating equation, regardless of the number of series. The results in Table 4 indicate that the null hypothesis of no cointegration was rejected, since both the the trace statistics and maximum Eigen value showed at least one cointegrating equation between the variables at 5% significance level. For example, taking into consideration the trace statistics, 108.0364 exceeds the critical value of 95.7 at 5% level of significance and taking into account the significant P value, the null hypothesis of zero

cointegrationwas rejected. The same conclusion can be drawn about the maximum eigen statistic since it showed one cointegrating equation as specified in part b of Table 4. Therefore, the results from the Johansen cointegration test in our estimation revealed the existence of a long run equilibrium relationship between the series.

Table 5. Results of the normalized cointegrating vector

DV:LCPI	Normalized cointegrating coefficients (standard error in parentheses)				
	LGDP	LGEXP	LIR	LM1	LREXR
Coefficient	0.398851	-32.69676	-9.673746	-1.145209	2495.539
Std. errors	(-0.85723)	(-5.98401)	(-2.41489)	(-1.12402)	(-422.527)
t-statistic	0.46528	-5.46402	-4.00587	-1.01885	5.90623

Source: Authors compilation obtained by Eviews

The results in Table 5 indicate the long run cointegration relationship, from which we reveal that the budget deficit has a positive and statistically significant impact on inflation in the long run. Therefore, in terms of ceteris paribus, a 1% point increase in the ratio of budget deficit to GDP, increases inflation by approximately 32.7% at 1% significance level. The t ratio statistic is 5.46402, which is statistically significant. Furthermore, the results revealed that money growth has a positive long run impact on inflation, which is highly statistically significant. The results showed that 1% increase in narrow money supply increases inflation by approximately 1.14521 at 1% significance level, holding other factors constant.

On the other hand, the results revealed that a rise in exchange rate leads to a decrease of inflation of inflation in the long run. This result confirms that a rise in the real exchange rate causes an increase in the prices of domestic goods and become less competitive compared to imported goods.

Regarding GDP growth, the results showed that its effect on inflation is significantly negative which means that expansion in GDP growth in an economy is considered as a potential way of reducing inflation. Furthermore, the results showed that interest ratehas a significant positive impact on inflation in the long run, that is, a 1% increase in interest rate leads to increase of inflation by about 9.67% in the long run.

Table 6. Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.	
LGDP does not Granger Cause LCPI	66	0.5445	0.5829	Accept
LCPI does not Granger Cause LGDP		0.35143	0.7051	Accept
LGEXP does not Granger Cause LCPI	66	0.55865	0.5749	Accept
LCPI does not Granger Cause LGEXP		1.40831	0.2524	Accept
LIR does not Granger Cause LCPI	66	0.84313	0.4353	Accept
LCPI does not Granger Cause LIR		3.58666	0.0337	Reject
LM1 does not Granger Cause LCPI	66	0.52108	0.5965	Accept
LCPI does not Granger Cause LM1		2.81	0.068	Reject
LREXR does not Granger Cause LCPI	66	1.4668	0.2387	Accept
LCPI does not Granger Cause LREXR		0.45029	0.6395	Accept
LGEXP does not Granger Cause LGDP	66	0.67559	0.5126	Accept
LGDP does not Granger Cause LGEXP		0.52101	0.5965	Accept
LIR does not Granger Cause LGDP	66	0.03311	0.9674	Accept
LGDP does not Granger Cause LIR		0.36277	0.6972	Accept
LM1 does not Granger Cause LGDP	66	1.51096	0.2288	Accept
LGDP does not Granger Cause LM1		0.7379	0.4823	Accept
LREXR does not Granger Cause LGDP	66	2.09925	0.1313	Accept
LGDP does not Granger Cause LREXR		0.45622	0.6358	Accept
LIR does not Granger Cause LGEXP	66	3.79381	0.028	Reject
LGEXP does not Granger Cause LIR		0.69998	0.5005	Accept
LM1 does not Granger Cause LGEXP	66	0.61998	0.5413	Accept

LGEXP does not Granger Cause LM1		0.29529	0.7454	Accept
LREXR does not Granger Cause LGEXP	66	0.16721	0.8464	Accept
LGEXP does not Granger Cause LREXR		6.10483	0.0038	Reject
LM1 does not Granger Cause LIR	66	1.35928	0.2645	Accept
LIR does not Granger Cause LM1		1.12581	0.331	Accept
LREXR does not Granger Cause LIR	66	2.47192	0.0928	Reject
LIR does not Granger Cause LREXR		5.91974	0.0045	Reject
LREXR does not Granger Cause LM1	66	0.18525	0.8314	Accept
LM1 does not Granger Cause LREXR		4.29254	0.018	Reject

Source: Authors compilation obtained by Eviews

Pairwise Granger causality tests are used to further analyse the causal relationships between the selected macroeconomic variables. The Granger causality results presented in Table 6 point out that some null hypothesis had to be rejected, while other could not be rejected. The results in Table 6, confirmed that not statistically significant causality running from the budget deficit to inflation or vice versa from the inflation to budget deficit in the short run. Furthermore, the results showed a unidirectional causal relationship between money supply and inflation at 5% level of significance. Therefore, changes in money supply granger cause variations in inflation, but inflation does not provide a feedback effect to money supply in the short run in Republic of North Macedonia. The results of the study indicated absence of causality relationship from the budget deficit to money supply or vice versa, from the money supply to budget deficit in the short run. The resultsobtained in our study support the unidirectional affirmation by theories such as the traditional approach to budget policy and empirical studies by Ahking and Miller (1985) and Hamburger and Zwick (1981), but contradicts with the Ricardian Equivalence Theory.

Table 7.Vector Error Correction Model

Long run co-integrating vectors Dependent variable CPI (inflation)				
Variables	Coefficient	Std	t -statistic	Prob.
GDP	0.040613	0.039204	1.035953	0.3009
GEXP	-0.002971	0.003981	-0.74636	0.456
IR	0.003858**	0.001849	2.086367	0.0377
M1	-0.026215*	0.017016	-1.54064	0.1243
REXR	0.000281***	4.50E-05	6.206928	0
Short run dynamics Dependent variable CPI (inflation)				
Variables	Coefficient	Std	t -statistic	Prob.
Error correction	-0.013709	0.02558	-0.53592	0.5924
ΔGDP	0.030644	0.079709	0.384455	0.7009
ΔGEXP	-0.018303	0.763511	-0.02397	0.9809
ΔIR	-3.024053	1.85716	-1.62832	0.1044
ΔM1	0.125581	0.195398	0.642693	0.5208
ΔREXR	73.61895	54.61522	1.347957	0.1785

Source: Authors compilation obtained by Eviews

Vector error correction coefficient gives the speed of adjustment within which the model will restore to equilibrium following any disturbances. The long-run causality test from the VECM indicates that causality runs from interest rate and real exchange rate to inflation, since the coefficients are positive and statistically significant. However, the error correction term in the GDP equation is positive and statistically insignificant, which means that the error correction term does not contribute to explain the changes in inflation (CPI). The coefficients of the error term of budget deficit (GEXP) and narrow money supply (M1) are negative and statistically insignificant in the long run, which indicate the absence of significant adjustments toward long run equilibrium in any disequilibrium situation. The results from Table 7 further show that gross domestic product,

budget deficit, money supply and real exchange rate have no statistically significant impact on inflation in the short run. This implies that gross domestic product, budget deficit, money supply and real exchange rate have a neutral impact on the process of inflation in the Republic of North Macedonia.

VI. Conclusion and recommendations

The main conclusion from the analysis is the existence of the long-run relationship among inflation, budget deficit and money supply. Namely, this arose from the fact that there is a Grangercausality in at least one direction among the variables.A long-run stationary relationship among the budget deficit, money supply, inflation, gross domestic product, interest rate and real exchange rate has been found to hold for the Republic of North Macedonia. Normalizing the only relation for the annual change of CPI reveals that some variables in the model such as interest rate and real exchange rate had a positive and significant long run relationship with inflation, while others such as budget deficit and money supply had negative and insignificant long run relationship with the inflation. Results from the Granger causality test revealed a unidirectional causal relationship between money supply and inflation in the short run. No statistically significant causation is found from inflation to the budget deficit or from the budget deficit to money supply in the short run. From the analyses, it can be confirmed that the inflation is caused only by monetary factors.

Therefore, a comprehensive package of policies is needed to tackle inflation; through the changes in monetary and exchange rate policies. There is a need for strong measures to accelerate the development of the domestic capital market, but in the same way to adopt a restrictive but relatively flexible monetary policy in which the money supply is limited to grow steadily at the rate of real output.From the growth of moneylargely influenced by credit expansion, it is necessary to limit government borrowing to financial deficits. Therefore, it is necessary to develop domestic capital markets, making securities yields more attractive to the public. This will reduce dependence on state borrowing in the banking sector, which is inflationary. It is alsorequired that the government reduce deficit levels and resort only to spending what is available; in order to reduce the level of price changes in the economy that have had negative effects on an economy.

The key implications for this study are that inflation in the Republic of North Macedonia is caused entirely by monetary factors, so the key measures are required to be undertaken in the monetary, as well as exchange rate policies to deal with inflation.

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