

**Fixed Exchange Rate and Foreign Exchange Intervention Case of North
Macedonia Period from 1997 to 2017****Merale Fetahi¹****Ali Maksuti²*****Abstract***

The aim of this paper is to analyze fixed exchange rates and foreign exchange intervention in case in North Macedonia, in this research paper used quartaly date from 1997 to 2017. Variables used in this research paper as exchange rate, norm of interest, money demand and inflation. Model that have used is Robust regression as a regression model, as a model for binary, used Exact Logistic Regresion. The results of research paper show us that all variables are linearity, relationship between the predictors and the outcome variable are linear, errors are normally distributed, homogeneity of variance (homoscedasticity) are constant and independence – errors of one observation is not correlated with the errors of any other observation. . While we compare these periods will give some possibilities for the North Macedonian currency movements in relation to macroeconomic policies.

Keywords: fix exchange rates, foreign exchange intervention, monetary policy.

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I. Introduction

The economic benefits of trade between nations in goods, services and other assets are similar to the benefits of trade within a nation. In all cases, trade in goods and other services permits greater specialization and efficiency, whereas trade in assets allows financial investors to earn higher returns while providing funds for worth-while capital projects. (S. Bernanke, 2004). So, international transactions generally require that one currency be traded for another (for investment, buy-sell goods or services etc), the relative values of different currencies are an important factor in international economic relations. All the time, modeling and forecasting the exchanging rate has been an important issue in international finance since the inception of the flexible exchange rate regime in foreign financial markets. (Kouretas, 1996). A fixed exchange-rate, generally referred to as a peg, is well-defined as an exchange-rate committed to maintain a fixed domestic currency, either to a foreign currency, a currency basket, or any other tangible measure of value. The monetary authority determines the exchange-rate and commits to buy or sell the domestic currency at a specific price. This predetermined price level is maintained by the monetary authority through interest rate adjustments and/or official intervention in the foreign-exchange market. (Sebastian Fristedt).

So, general rules in economics is that the basic objective of the macroeconomic policy in a long run is an increase in the society's prosperity, represented through an increase in the employment and the living standard. Accordingly, the monetary policy, as one of the major instruments of the economic policy, has to contribute in achieving the objective of increasing the society's prosperity. (Bišev G., 1997)

In North Macedonia main role of the National bank of North Macedonia is maintaining price stability through the manipulation of money supply and interest rates. The Central Bank is also responsible for the stability of the financial system, that determines the National Bank of Macedonia to perform supervisory and settlement functions. The Central Bank is fully independent in achieving its main functions, which means it is independent in selecting the monetary strategy for maintaining price stability and it can unlimitedly use monetary policy instruments in order to achieve the final goal. (Bišev, 1997). Monetary policy one of most important sector about the growth and stability of economy, for that reason have work in this case of study with this research paper about the case of North Macedonia in period of from 1997 to 2017. Comparing the periods we have result that monetary policy in case of North Macedonia is stable and foreign exchange rate have had influence in national fixed rate time after time (especially in period of our study). The aim of this research paper is to analyze fixed exchange rates and foreign exchange intervention in case in North Macedonia, in this research paper used quarterly date from 1997 to 2017. The objective of this paper is to review the channels through which the choice of exchange-rate theoretically has had the economic growth performance during the recovery period following a financial crisis, political impact and to empirically investigate the statistical validity. The analysis of fixed exchange rate and foreign exchange intervention in case of North Macedonia is based on data sources obtained from the EIU Databases, International Financial Statistics (IMF sector) (The sample covers the period from the first quarter of 1997 up to the first quarter of 2017. We work with quarterly values of the following variables: Exchange rate of denar per euro (ER) Norm of interest (NI) Inflation (INF) and Money demand.

II. Literature review

The specifics of this research paper is that some details have been used from relevant institutions in North Macedonia and other from international financial institutions. In the process of work-studies, since we have started to work on the empirical research paper, the literature has used from authors that discussed about fixed exchange rate in period from 1997 to 2017, we have used materials from international authors and other research studies about the same topic. At the same time have used literature and details from relevant international financial institutions. Then, have explain precisely why the exchange rate and its mobility are important in an open economy and to analyze how they would affect the economy. The macroeconomic equilibrium is found where the YY and LL curves intersect. The YY curve indicates the product market equilibrium with the positive relationship between exchange rate level, exports and quantity of output while the LL curve means the money market equilibrium with the short-run negative relationship between exchange rate and income but the long-run curve is vertical at the natural level of output. When the economy reaches the long-run equilibrium, the expected exchange rate level will have adjusted to equal the actual exchange rate level. This implies that when some event increases money supply, the short run LL curve shifts to the right. The economy moves upward as the exchange rate level rises and output increases (Choi, 2017). The paper would like to explain how the real exchange rate and its variability can affect trade balance and real GDP. In this sense, this section is seeking to deliver clear motivation showing major signs with links to theoretical models.

This section employs the existing literature to formulate empirical models. There is a vast literature on effects of real exchange rate depreciation on the trade balance and the output. Our first interest is exploring the response of the trade balance to the exchange rate change at the aggregate level. The long-run relationship of the trade balance and the exchange rate will end up with the following model based upon Zhao (2010) and (Gligoric, 2010):

$$TB_t = \alpha + \beta_1 X_t + \beta_2 Y_t + \beta_3 V_t + \epsilon_t \quad (10)$$

Where TB_t is the log of real trade balance, which is real exports divided by real imports at time t , X_t is the log of real effective exchange rate at t , Y_t is the log of domestic real gross domestic product at t , V_t is the log of real effective exchange rate volatility at t , ϵ_t means the disturbance att, and α is the constant. β_1 , β_2 and β_3 are the coefficients that measure the effect of ΔX_t or ΔV_t on $\Delta E(TB_t)$, all other things held constant where Δ is the rate of increase operator and E is the expectation operator. Additionally, a real effective exchange rate can be a better indicator for the economy because it focuses on the business cycle movements between real exchange rates and other aggregate variables, providing a measure of purchasing power of a foreign currency relative to its domestic purchasing power.

The contemporary empirical growth literature draws on a general framework that specifies that the growth rate (GR) of a country at time t is a function of state variables (SV) and control variables (CV). This general specification of economic growth is consistent with both the neoclassical and the endogenous models of growth.

Equation 1. General growth framework specification $GR_t = F(SV_t : SV_t)$

The exchange-rate determines the price at which the domestic currency is valued in terms of foreign currencies. The exchange-rate is of great practical importance to those market agents involved in international transactions, whether it be for investment or trade. In addition, the

exchange-rate also has a principal position in monetary policy, where it may be used as an instrument, a target, or an indicator- depending on the particular framework of monetary policy (Latter, 1996). Referring in this, case of North Macedonia, especially and other developing countries, have same position.

Another point of research is useful and information of a number of central bank research papers follow the literature on models of exchange rate determination in the long-run that build on PPP conditions.³ Arbitrage in goods markets should lead to the law of one price for each good, which aggregates to PPP for identical baskets of traded goods. Although flatly rejected in earlier research, arguably due to the low power of the tests employed recent research is more favour to PPP tested on long time spans or panels of industrialized countries.⁴ The literature has also highlighted that the relevance of PPP is limited to traded goods.⁵ Research conducted at the Central Bank of Norway, for example, finds evidence that PPP holds for Norwegian data. (Jeffery Amato, Research on exchange rates and monetary policy: an overview, 2005)

III. Data and methodology

The empirical studies on the effects of changes in exchange rates on inflation and real activity can be broadly divided into four categories: single-equation econometric methods, vector autoregressive (VAR) models, structural macro econometric models and DSGE models. (Jeffery Amato, 2005). But, we have discussed in this research paper the fixed exchange rate in case of North Macedonia for a period 1997-2017 and have used model :

$$\text{GDPGrowth} = \alpha + \beta_1 \text{FIX} + \beta_2 \text{FLEX} + \beta_3 \text{GDPdrop} + \beta_4 \text{CA} + \beta_5 \text{FDI} + \beta_6 \text{CF} + \beta_7 \text{PC} + \beta_8 \text{T} + \beta_9 \text{RES/GDP} + \varepsilon$$

Where details of the model are :

GDP Growth – average per capita GDP growth – dependent variable α - intercept (intermediate regime)

FIX – Dummy = 1 if exchange –rate is fixed = 0 otherwise

GDPdrop – intial drop of per capita GDP growth + CA – current account balance as a ratio of GDP FDI – Foreign Direct Investment as a ratio of GDP CF – Capital Formation as a ratio of GDP

PC – Domestic Private Credit as a ratio of GDP T – Trade as a ratio of GDP

RES/GDP – Foreign exchange reserve as a ratio of GDP ε - Error term

These data set were taken from IMF- international monetary fund, NBNM- National Bank of the North Macedonia, Exchange rate of denar per euro / before 2000 in Deutch Mark also has been used in this research paper which is taken from National Bank of North Macedonia, as other determinants we have used also Norm of interest (NI) Inflation (INF) and Money demand. We have used the time series data with the previously mentioned variables that were included in the model, also our data set expanded with two DUM variables. The first was in 1997 when was the first inflation and the second DUM is when changed the currency into Euro in 1999.

This stands in sharp contrast with the development of the real effective exchange rate of the Macedonian Denar, obtained from the official statistics of the National Bank of the Republic of Macedonia, that depreciated by some 30 percent from 1997 to 2005 and than from 2005 to 2017 . The striking divergence could be explained by two positions relating to the composition of the

data. First is the Serbian denar occupies a central role in the effective exchange rate with a weight of 18.4% in 2003, and it appreciated strongly against the Macedonian denar as a result of high inflation rates. Second, the different composition and the different weights used in the consumer price indexes and in the GDP-based price levels can also yield diverging outcomes. The subsequent sections will explore these two composition effects. This is and from the author of the research paper (Jane Bogoev, 2008)

Our regressions on economic growth recovery period from 1997 to 2017 leads with an examination of the unconditional effect of the choice of exchange-rate and then precedes by sequentially adding variables that capture and control for the initial conditions and the linkage to trade and financial channels. (IMF classification and Reinhart & Rogoff classification).

<i>IMF de facto classification</i>				
<u>Specification</u>	<i>No controls</i>	<i>+ Initial conditions,</i>		
		<i>trade exposure, financial channels & Oilx</i>	<i>High-income countries only</i>	<i>Low-income countries only</i>
<i>α</i>	-1.6175 (1.5677)	0.7634 (1.3674)	1.4516 (1.8915)	-.1279 (1.8989)
<i>Fix</i>	2.4334 (1.6354)	.3030 (1.0025)	.3410 (.9556)	-.4186 (1.0224)
<i>Flex</i>	3.3838 (1.6180)	1.1219 (1.0009)	1.1968 (.9610)	.8149 (1.1229)
<i>Adjusted R-squared</i>	0.0452	0.6569	0.6417	0.3713
Notes				
1. Robust standard errors in parentheses: ***p<0.01, **p<0.05, *p<0.1				
2. Fixed regime=1 for hard peg to conventional peg, otherwise=0				
3. Flexible regime=1 for managed float to pure float, otherwise=0				
4. High-income=1 if GNI per capita X>\$4,125				
5. Low-income=1 if GNI per capita X<\$4,125				

From the specification IMF are shown the results of the Fix exchange rate and flex exchange rate in case of high income countries and in low income countries. Flexible exchange rate an exchange rate whose value is not officially fixed but varies according to the supply and demand for the currency in the foreign exchange market and fixed exchange rate an exchange rate whose value is set by official government policy. (S.Bernanke, Principles of economics , 2004).

<i>Reinhart & Rogoff de facto classification</i>				
<u>Specification</u>	<i>No controls</i>	<i>+ Initial conditions,</i>		
		<i>trade exposure, financial channels & Oilx</i>	<i>High-income countries only</i>	<i>Low-income countries only</i>
<i>Intercept</i>	1.3110*** (.5531)	.4794 (.9506)	.7871 (1.7922)	-.5244 (1.8673)
<i>Fix</i>	-.7039 (.7610)	.1672 (.4698)	.1708 (.6084)	.1491 (.9124)
<i>Flex</i>	.5009 (.7490)	.8756** (.4587)	1.7733*** (.7661)	1.1648 (.9565)
<i>Adjusted R-squared</i>	0.0092	0.6536	0.6586	0.3675
Notes				
1. Robust standard errors in parentheses: ***p<0.01, **p<0.05, *p<0.1				
2. Fixed regime=1 for hard peg to conventional peg, otherwise=0				
3. Flexible regime=1 for managed float to pure float, otherwise=0				
4. High-income=1 if X>\$4,125				
5. Low-income=1 if X<\$4,125				

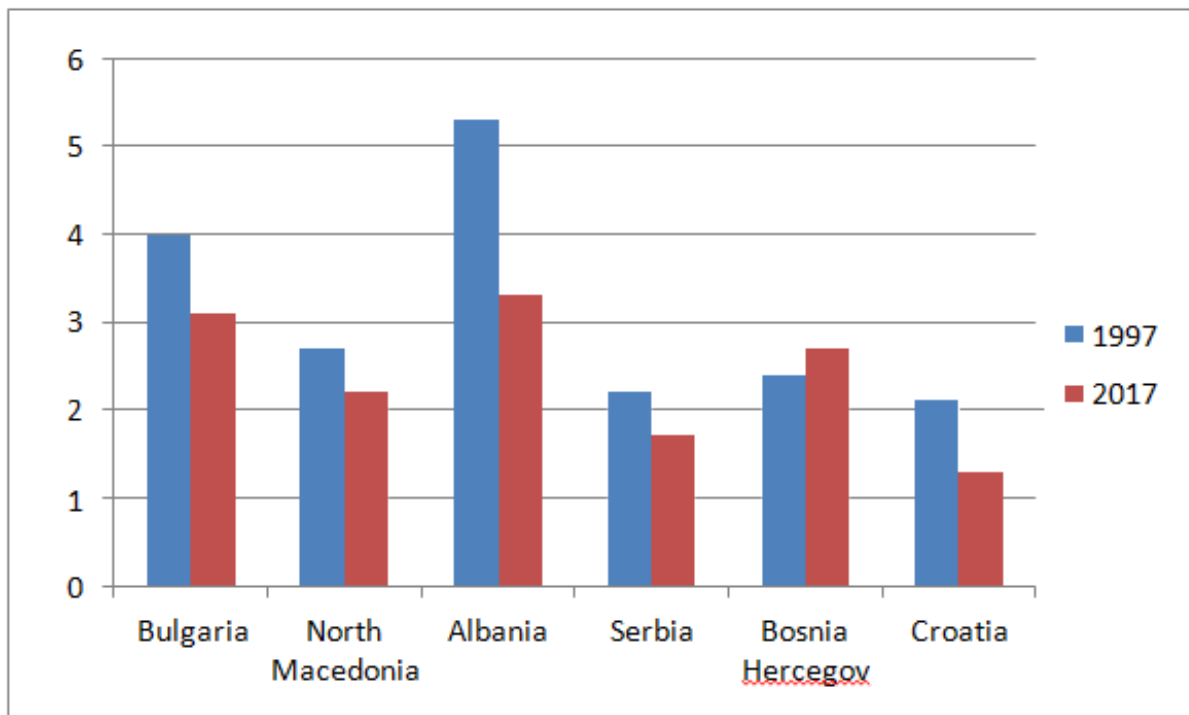
The starting point of our analysis is purchasing power parity (PPP). When using absolute price levels (expressed in units of the foreign and domestic currencies), absolute PPP would imply that the domestic price level expressed in terms of the foreign currency (P/E)¹ is equal to the foreign price level (P*). Put differently, the real exchange rate, obtained as the foreign to domestic price level should be

$$1 \text{ (} (P/E=P^* \Rightarrow P^*/(P/E)=EP^*/P=1 \text{)}.$$

Yet it is widely acknowledged that the real exchange rate of less developed countries are undervalued in terms of absolute PPP because lower non-tradable prices, and also because goods prices are cheaper due to lower quality and lower non-tradable component. (Balázs Égert, 2006).

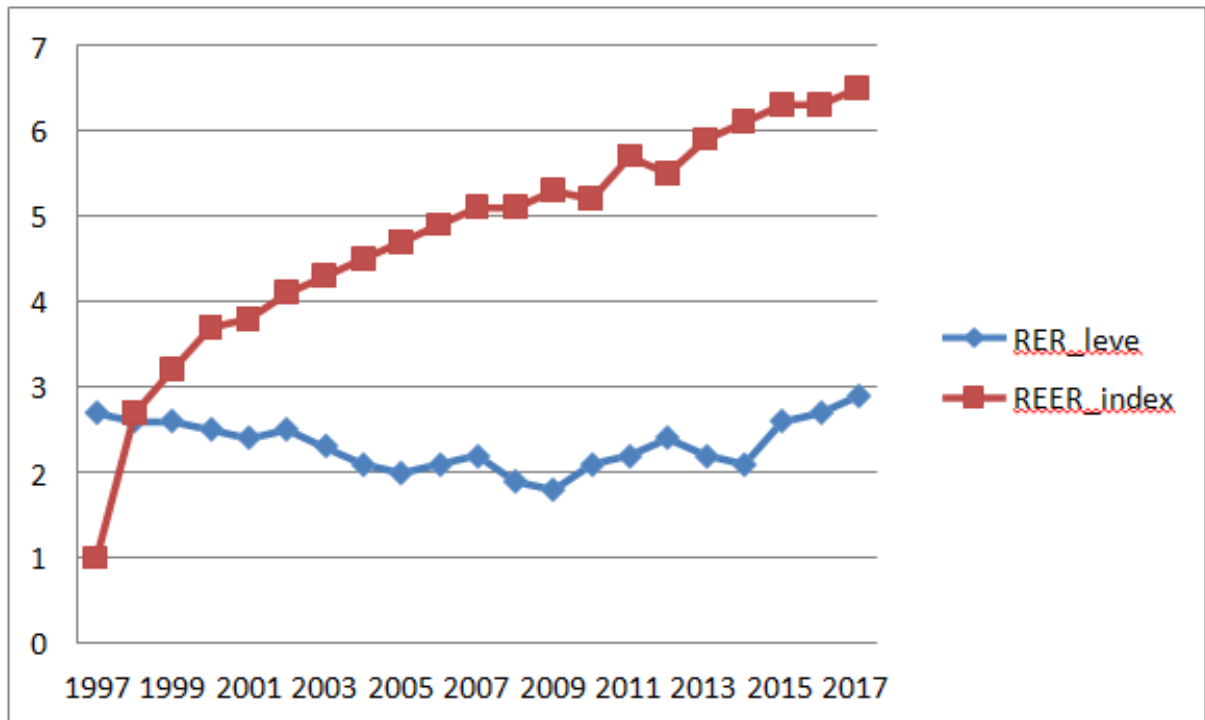
Real exchange rates constructed using absolute price levels and against the euro now, and other European currencies before 1999 y., viewed on Figure 1 below, are different to 1 in Balkan countries. The fact that the figures exceed unity indicates substantial in terms of PPP for all transition economies of Balkan countries. At the same time, a convergence towards absolute PPP took place from 1997 to 2017 in line with progress achieved in real convergence in general, and in productivity levels in particular. Macedonia is no exception to this rule: real exchange rate fell from 1997 to 2017. However, the real exchange rate was among the most undervalued in 2005.

Figure 1: Real Exchange Rates in Levels with other Balkan countries



Source: Authors' calculations based on data obtained from the WIIW's annual database 2018.

Figure 2: Real Exchange Rates in Levels the the Euro Area

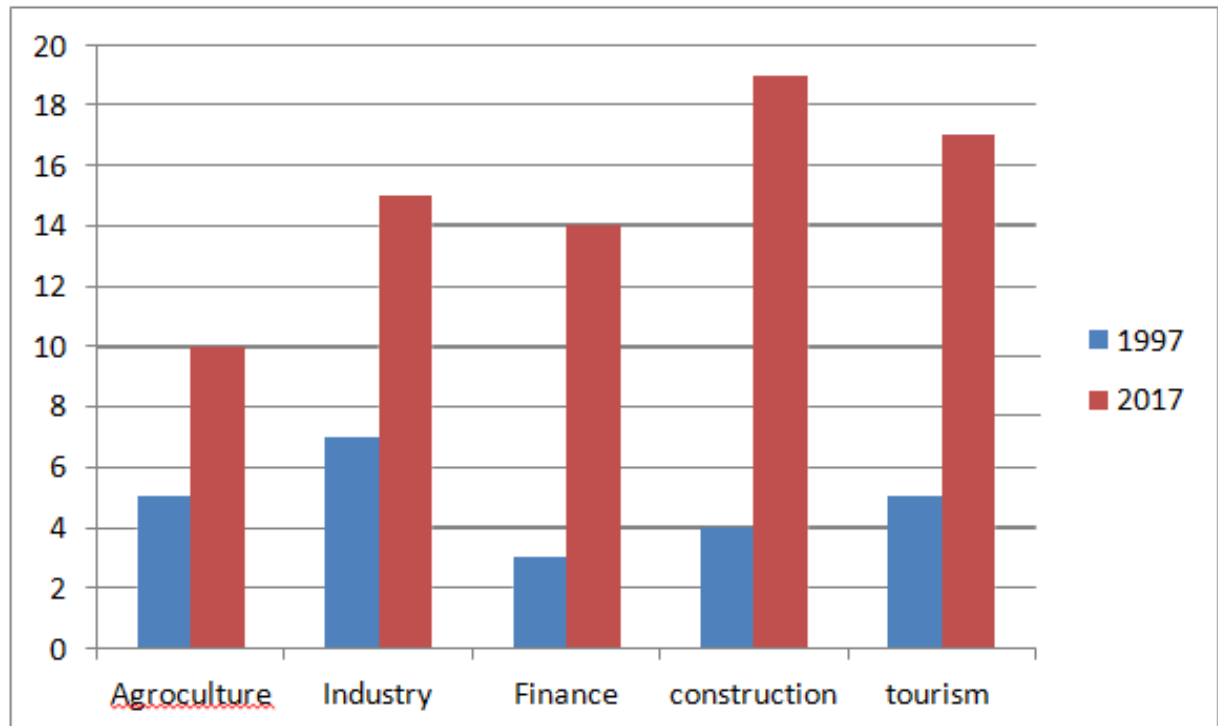


Source: Authors' calculations based on data obtained from the WIIW's annual database 2018.

From the results of calculations in Figure 2 and from the official statistics of the National Bank of the Republic of Macedonia, that depreciated by some 42 percent from 1997 to 2017 . The divergence could be explained by two factors relating to the composition of the data. First one is the Serbian Dinar effects a central role in the effective exchange rate (with a weight of 19.4% in 2003), and it appreciated strongly against the Macedonian Denar as a result of inflation rates. Second, the different composition and the different weights used in the consumer price indexes and in the GDP-based price levels can also yield diverging outcomes.

Another point of academic discussion in this research paper is productivity in report with exchange rate, so positive reports between real exchange rate and productivity differential is usually considered to reflect the B-S effect. Similarly, an increase in net foreign asset, in the context of the stock-flow models (Rogoff, 1995), is also associated with a real exchange rate appreciation. We have calculate the productivity of five sectors in relationship with exchange rates in North Macedonia from 1997 to 2017. And in figure 3 are viewed the growth of sectors , from the investments from foreign currencies.

Figure 3: Sectoral Productivity Growth, 1997-2017



Source : State statistic reports from 1997-2017

One part of our studies in this research paper is and the important effect of Balassa-Samuelson for real exchange rate dynamics in period of 1991-2005 in North Macedonia, and then we have continue working in this case for other year from 1997 to 2017. But the report of IMF and other studies about this topic are with some basic conclusions on indirect evidence. Especially we se at the report of IMF, from authors (Tuladhar, 2005) , they regressed the CPI – based real exchange rate and the PPI - deflated real exchange rates on their productivity variables found that productivity had similar effects on both exchange rate series till 2005 . and from our studies this process was with similar effect, only with small nuances that has shown variations, especially in 2008. Nevertheless, if PPI were a good measure for tradable prices, then productivity should not have any effect on the PPI-based real exchange rate given that in the Balassa-Samuelson framework, the real exchange rate of the tradable sector is pinned down by the Purchasing Power Parity condition. (Magdalena Petrovska, 2008).

In this case we have used Johansen Co integration test to estimate the long run reports between two basic variables of the research paper

$$REERCPIA_t = \beta_0 + \beta_1 DPROD + \beta_2 NFA$$

We used quarterly data covering the period 1997:1-2017:4. Co integration tests indicate the existence of one co integrating equation. Normalizing for the REER, we find the following the long run equation:

$$REER \ 6.71 \ 1.24dprod \ 0.16nfa$$

$$0.05 \ 0.15$$

Table 1 - Unit Root and Co integration Tests

	Augmented Dickey-Fuller	Phillips-Perron
REER (CPI)	-1.63	-1.71
D (REER) CPI	-4.65	-4.77
REER - PPI	-1.62	-1.61
D-REER_PPI	-4.11	-3.89
ProD	-2.88	-1.8
D_proD	-2.66	-2.71
Nfa	-0.25	-0.36
D(Nfa_)	-4.79	-4.82

Note: Critical values are 3.66(1% level), 2.95 (5 % level) and 2.61 (10 % level)

It suggests that a decline in domestic productivity growth relative to its trading partners leads to a depreciation of the real exchange rate. The positive relationship between the REER and the productivity differential does not necessarily imply that a B-S effect is at play in North Macedonia.

For more investigate the possibility of persistent deviation from PPP in prices of tradable goods between North Macedonia and partners, so we have estimated the effect of productivity differential on PPI-based real effective exchange rate and compare the results with those obtained using the CPI-based REER.

$$CPI\ REER_t = \beta_0 + \beta_1 DPROD + \beta_2 NFA \quad PPI\ REER_t = \delta_0 + \delta_1 DPROD + \delta_2 NFA$$

The Balassa-Samuelson hypothesis shown us that productivity growth will not have major impact on the PPI based real exchange rate, but will have a significant impact on the CPI-based REER (through the non tradable sector). In this case of equations above, this would imply that δ_1 is not significantly different from 0. If δ_1 is significantly different from zero and not significantly different from β_1 , this will suggest that the impact of productivity on the REER is transmitted mainly through the tradable sector. In other words, PPP does not hold.

Estimation results shown us that the impact of productivity growth on PPI-based REER is not significantly different from the effect on CPI-based REER which are shown in table 2, confirming that the depreciation of the CPI-based real exchange rate comes mostly through the tradable sectors that we have mention before. This is for reason for such state as open economy such as North Macedonia, where the share of tradable in the economy is relatively high.

Table 2 – Co - integration results

	Differential Productivity	Net ForeignAssets
REER CPI	1.45(0.15)	0.21(0.05)
REER PPI	1.19(0.15)	0.17(0.05)

Sources: Statistic office of North Macedonia for period 1997-2017

We have done a cross-check and used the Johansen co integration test technique to prove that only one co integration vector is present in the data observation for the period from 1997 to 2017. From the five models identified by the ARDL model, four were confirmed by the VAR-based Johansen technique test. All these four models have problems in terms of the residuals when normality and serial correlation is checked on the residuals of the VAR and VECM. Only two models passed the residual checks for the VAR and none of them for the VECM. So, single

equation models seem to be more robust in meeting the basic hypothesis of well behaved residuals than the VAR-based estimations. Turning to the interpretation of the results, several observations merit attention.

So we tried to establish co integration between the officially published real effective exchange rate series and the fundamentals. Using the real exchange rate series we constructed more encouraging results, even though it did matter which definition of the real exchange rate (weights in the CPI normalized to North Macedonia) And than the productivity differential, the government consumption and the openness variables were found to be fairly robust in terms of sign and size. Net foreign assets and terms of trade enter less often the co integrating vectors.

These models are shown at the tables below and are the results of all five models of ARDL.

Table 3 – ARDL model 1

	Model 1	Model 2	Model 3	Model 4	Model 5
	REER 1	REER 2	REER 1	REER 1	REER 2
lags	2.1	2.1	2.1	2.1	2.1
ECT	-0.203	-0.242	-0.0664	-0.624	-0.941
UR	-4.322	-4.293	-5.395	-4.658	-6.775
F-test	5.648	6.442	6.577	7.311	5.913

Source: Authors' calculations based on data obtained from the WIIW's annual database 2018

Indicate statistical significance at the 10% and 5% levels, respectively. ECT, UR and F-test refer to the error correction term, the co integration tests based on the residuals of the long-term coefficients and the F-test proposed in Pesaran et al. (2001), respectively. "lags" indicates the lag structure of the error correction representation of the ARDL.

Table 4 – Johansen Test

	Model 1	Model 2	Model 3	Model 4	Model 5
	REER 1	REER 2	REER 1	REER 1	REER 2
Model	M4	M4	M2	M2	M2
R=0	0	0	0	0	0
R=1	0.72	0.64	0.71	0.66	0.91
R=2	0.72	0.66	0.79	0.81	0.89
R=3	0.61	0.54	0.68	0.79	0.81

Source: Authors' calculations based on data obtained from the WIIW's annual database 2018

Johansen approach, M4: the series and the co integrating equation have a trend, M2: series have non-zero mean, the co integrating vector contains an intercept. The models are selected using the Schwarz information criterion.

Table 5 -

Root AUTOCORRELATION	OK	OK	OK	OK	OK
VAR	Ok	OK	OK	Ok	NO
VECM	NO	NO	NO	NO	NO
Multivariate J-B normality					
VAR	0	0.05	0.16	0.07	0
VECM	0.41	0.31	0.26	0.43	0

Source: Authors' calculations based on data obtained from the WIIW's annual database 2018

“OK” (“NO”) indicates that the inverse roots of the model are lower than 1 and the absence (presence) of serial correlation in the residuals of all equations (any of the equations). J-B normality for the Johansen method stands for the Jarque-Bera multivariate normality tests. A figure higher than 0.05 indicates that the null hypothesis of normality cannot be rejected at the 5% level.

IV. Conclusion

The results of research paper show us that all variables are linearity, relationship between the predictors and the outcome variable are linear, errors are normally distributed, homogeneity of variance (homoscedasticity) are constant and independence – errors of one observation is not correlated with the errors of any other observation. . While we compare these periods from 1997 to 2017 will give some possibilities for the North Macedonian currency movements in relation to macroeconomic policies. Productivity and other explanatory variables such as government consumption (GC) , openness and net foreign assets were found to be fairly robust both in terms of sign and size. The productivity variable has a positive sign. This means that an increase/decrease in the productivity variables is associated with an appreciation/depreciation of the real effective exchange rate. So, increasing net foreign assets and finance has tend to generate a currency appreciation that is in line with finding for established market.

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