IMPACT OF MACROECONOMIC VARIABLES ON STOCK MARKET INDEX IN BOSNIA AND HERZEGOVINA

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Abstract

The relationship between macroeconomic variables and stock market indices is well documented and investigated around the world. However, there is a certain gap in the literature regarding the relationship between macroeconomic variables and stock market index in Bosnia and Herzegovina. Thus, this paper examines the impact of macroeconomic variables in Bosnia and Herzegovina on stock market index (SASX-30). The results show that volatility of exchange rate in Bosnia and Herzegovina has significant impact (at 10%) on stock index return and volatility. Furthermore, the results show that the deposit (interest) rate and Industrial Production Index (IPI) have slightly negative significant long-term impact on stock index return.

Keywords: *SASX-30, macroeconomic variables, return, volatility, B&H*

INTRODUCTION

For understaning stock market reports it is important to understand that the price of the securities and all other financial instruments in long term is moving in accordance with the movement of some economic and political fundamentals and trends. These fundamentals are economic and political factors outside (external) of the markets and they dictate markets trends for one type or for a group of securities, or even for the whole market. In long term they determine all the stock movements and effect the value of all types of the financial instruments. The stock prices, in principle, have tendency to grow when the state of economical conjucture is favorable, and to fall down when the economy is weak. The number of factors that can influence stock price is large. Some of them have prompt effect, while other factors have long term effects. The fundamentals can, for example be, increase or falling of industrial production, inflation etc..

Having in mind the core principles that are leading the stock markets, we can show the economic bases that effect the prices of all securities. Therefore, in this paper we will focus on investigating the effect of external factor on stock market in Bosnia and Herzegovina. These factors include inflation, industrial production, interest rate and exchange rate.

In the previous studies, the interaction of stock market returns and volatility and macroeconomic variables have been a subject of interest among researchers and practicioners. These type of studies have shown the existence of significant relationship between stock markets with macroeconomic variables in various countries.

While the association between stock market and economic activities is quite obvious regardless of its causality direction, a standardized set of macroeconomic variables is not found. Macroeconomic variables selected to examine the determinants of the stock market tend to be slightly different in various studies. However, Abdul Rahman et al[1] suggests that the rate of inflation, money growth, interest rates, industrial production, reserves and exchange rates are the most popular significant factors in explaining the stock market movement.

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1   Abdul Rahman, A., Mohd Sidek, N.Z. & Hanim Tafr, F. "*Macroeconomic determinants of Malaysian stock market*", African Journal of Business Management, 3(3), (2009), 95-106.

The focus of this research is on the stock market index in Bosnia and Herzegovina, SASX-30, and the macroeconomic variables for the period of past 9 years.

The work of Sarajevo Stock Exchange within the legal system of Bosnia and Herzegovina is based on the Law on Securities Market of the Federation of Bosnia and Herzegovina and other regulations.[2] That is why we consider the finances as an inseparable part of a state's legal system.

The Sarajevo Stock Exchange Index 30 (short form: SASX-30) is the index of the Primary Free Market of the Sarajevo Stock Exchange. It depicts the price movement of the issuers on the Primary Free market, which is reserved for the most liquid issuers from the Free market. The base date of the index is March 31st, 2009, and the corresponding base-value was set to 1.000,00 index points.

The main objective of this study is to investigate the existence and the nature of the relationship between some major contributing macroeconomic variables that have been proven in the past to influence the conventional indices across the region and globe and Sarajevo Stock Exchange Index 30. More specifically, the underlining purpose of this research is to ascertain the levels of influence the macroeconomic factors have on SASX-30 index. Macroeconomic factors under consideration are interest rate (deposit rate), Consumer Price Index (CPI), exchange rate (US/BAM) and Industrial Production (Industrial Production Index).

To recapitulate, the main objective of this study is to examine the relationship between macroeconomic variables and Sarajevo Stock Exchange Index 30 in Bosnia and Herzegovina, and also to investigate if policy makers are able to forecast economic outlook using Sarajevo Stock Exchange 30 Index.

The importance of this study can be vast and valuable in numerous vays. Firstly, for the policy makers as they need to understand the impact of their policies on the Sarajevo Stock Exchange Index 30. Secondly, for investors as they need to understand how the market will move given certain changes in the macroeconomic environment. Lastly, for researchers in the field to estimate the impact of policies and predict future movements of the SASX-30.

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2   See more at www.sase.ba

In the following paragraphs we will mention some of the studies that were investigating these issues, including both the issue of stock return as well as the issue of volatility of stocks, affected by the macroeconomic variables. Mentioned will be the literature dealing with the macroeconomic factors used in our research model, and their effect on stock market indices.

Literature review

In the previous studies, the interaction of stock market returns and macroeconomic variables has been a subject of interest among researchers and practitioners. These type of studies have shown the existence of significant relationship between stock markets with macroeconomic variables in various countries. In sum, based on their focus, these studies can be divided into two major categories. As Abdul Rahman et al.[3] suggest, the first category are studies that determine factors affecting stock prices such as studies by Sadorsky[4], Ibrahim and Aziz[5], Mavrides[6] and Chen[7]. The other part of studies investigate the factors shaping the volatility of stock return. Among these studies there are Beltratti and Morana[8] and Schwert[9].

While the association between stock market and economic activities is quite obvious regardless of its causality direction, a standardized set of macroeconomic variables is not found. Macroeconomic

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3   Abdul Rahman, A., Mohd Sidek, N.Z. & Hanim Tafr, F, *op.cit.,* 95-106.

4   Sadorsky, P. "*The Macroeconomic Determinants of Technology Stock Price Volatility*", Review of Financial Economics, (2003), 12, 191-205.

5   Ibrahim, M.H. & Aziz, H. "*Macroeconomic variables and the Malaysian equity market: A view through rolling subsamples*". J. Econ. Stud, 30(1),(2003), 6-27. https://doi.org/10.1108/01443580310455241

6   Mavrides, M. "*Granger Causality Tests of Stock Returns: The U.S. and Japanese Stock Markets*", Manage. Financ. 26(12), 13-25.

7   Chen, M.H. "*Risk and Return: CAPM and CCAPM*", Q. Rev. Econ. Fin. 43, (2003), 369-393.

8   Beltratti, A., & Morana, C., "*Break and Persistency: Macroeconomic Causes of Stock Market Volatility*". J. Eco, *131*, (2006), 151-177. https://doi.org/10.1016/j.jeconom.2005.01.007

9   Schwert, G.W. "*Why does stock market volatility change over time?*", The Journal of Finance, 44(5). (1989),

variables selected to examine the determinants of the stock market tend to be slightly different in various studies. However, Abdul Rahman et al.[10] suggests that the rate of inflation, money growth, interest rates, industrial production, reserves and exchange rates are the most popular significant factors in explaining the stock market movement.

The Theory

In the following paragraphs described will be the macroeconomic variables used in this study and theoretical background regarding relationship between these macroeconomic variables and stock market indices.

Interest Rate (Deposit rate)

Deposit (interest) rate is the interest rate used in this study. Deposit rate is the rate paid by commercial or similar banks for demand, time, or savings deposits.

Madura says that "one of the most prominent economic forces driving stock market prices is the risk-free interest rate."[11] Interest rate is a rate which is charged or paid for the use of money. Interest rates often change as a result of inflation and Central Bank policies. This can play a vital factor in deciding the amount of savings as opposed to borrowing. If interest rate is low, people will reduce savings in banks and invest more money in the market indexes. Therefore, it is considered that interest rate may play important role in stock markets.

Therefore, as Benaković and Posedel state "according to economic theory, the increase in interest rates should lead to a drop in stock prices."[12] Therefore we expect that interest is negatively correlated to stock returns.

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10   Abdul Rahman, A., Mohd Sidek, N.Z. & Hanim Tafr, F, *op.cit.*, 95-106.

11   Madura, J. (2008), *Financial Institutions and Markets*, Eight Edition, Thomson. 270

12   Benakovic, D., & Posedel, P. *"Evidence from estimitating a multifactor model on the croatin market",* Business systems research. (2010), 1-50, 42

Consumer price index (CPI) – Inflation

Benaković and Posedel state that **"**inflation, i.e., a rise in the general level of prices, reduces the real value of money, thereby reducing the expected cash inflow from an asset, exceptions being inflation-indexed securities. Investors who own some assets are exposed to changes in inflation, since their payment at the end of period depends on inflation during the holding period. Thus, inflation is expected to affect negatively the stock prices."[13]

Based on these empirical findings, we can expect that there should negative relationship between the CPI and the stock prices.

Industrial Production (IPI)

Along with gross domestic product (GDP), industrial production is the most widely used measure of economic activity.

Cvijetičanin states that "the indicator of the movement of industrial production has key role in the determination of state of business cycle. In principle it moves parallel with GDP and it can be used for projection of GDP and other indicators."[14]

Exchange rate

Economic theory asserts that exchange rates is important variable in developing a comprehensive understanding of the behavior of stock prices and index movements. Traditional economic models argue that changes in exchange rates affect balance sheet items of a firm through its competitiveness as expressed in foreign currency and ultimately, profits and equity leading to price adjustments in the capital markets. This volatility in price adjustments of individual firms leads to the impact on the index.

In this study based on the availability of data used is the value of domestic currency (BAM) per U.S. Dollar, end of period rate.

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13   *Op.cit*, 41-42.

14   Cvijetičanin, M. (2004). *Burzovno trgovanje: Priručnik za investitore i analitičare*, MASMEDIA. Zagreb.

Data and Methodology

This section describes the data and empirical methods used to investigate the relationship between the selected variables. In this study, SASX-30 index return and volatility was selected as the dependent variable, whereas the macroeconomic variables growth rates were selected as the independent variables.

Monthly observations of these two variables span the period between April 2009 and December 2017. This time frame is chosen based on the availability of the data. The data were obtained from the International Monetary Fund database and Sarajevo Stcok Exchange official database.

Augmented Dickey Fuller unit root test for the variables is used in the study. Unit root test has a crucial importance in the time series analysis as the choice of the techniques and procedure for further analysis and modeling of series depends on their order of integration (Buyuksalvarci and Abdioglu, 2010).

As the main analysis tool used in this study is autoregressive distributed lag (ARDL) model. It is used to investigate the long-run relationship between the macroeconomic variables and the stock market index.

The arithmetic return of the indices is estimated by subtracting the index value at time t - 1 from the index value at time t and dividing it by the index value at time t as shown in Eq. (1), where Rt is the return at time t, Pt is the index at time t, and Pt-1 is the index at time t - 1.

$$\text{Equation 1.} \quad \mathbf{R_t = (P_t - P_{t-1})/P_{t-1}}$$

The next step is the estimation of the volatility of the indices. Volatility is measured as square of the deviations from the mean. We consider that $\triangle y_t$ indicates the series with deviations from means.

As it can be seen in the Equation 2., the volatility of the indices is estimated as:

$$\text{Equation 2.} \quad \triangle y_t^2 = \left(\triangle y_t - \triangle \overline{y} \right)^2$$

$$\text{where} \quad \triangle \overline{y} = \frac{\sum \triangle y_t}{T}.$$

Before the volatility of the macroeconomic variables time series is estimated, the growth rate of the macroeconomic variables is estimated by subtracting the variables value at time t - 1 from the variables value at time t and dividing it by the variables value at time t as shown in Eq. (3), where Gt is the growth rate at time t, Bt is the varaiables rate at time t and Bt-1 is the variable rate at time t - 1.

Equation 3. **Gt = (Bt – Bt-1)/Bt-1**

The next step was the estimation of the volatility of the macroeconomic variables rate. Volatility is measured as the square of the deviations from the mean. We consider that indicate the series with deviations from means.

As it can be seen from Equation 4, the volatility of the macroeconomic variables rate is estimated as:

Equation 4. $\quad \triangle y_t^2 = \left(\triangle y_t - \triangle \overline{y} \right)^2$

where $\quad \triangle \overline{y} = \dfrac{\sum \triangle y_t}{T}$.

Empirical Analysis and Results

In this part of paper presented are graphs representing the movement of the two indices (price, return and volatility) over time, the unit root tests for the time series used in the analysis part, as well as the results of the ARDL analysis.

Graphical representation

In this section presented are values/prices, growth rates/return and volatility values of the stock market index and macroeconomc variables in Bosnia and Herzegovina for the observed time period.

In the Figures 1,2 and 3 presented are the price, return and volatility of Sarajevo Stcok Exchange Index 30 (SASX-30).
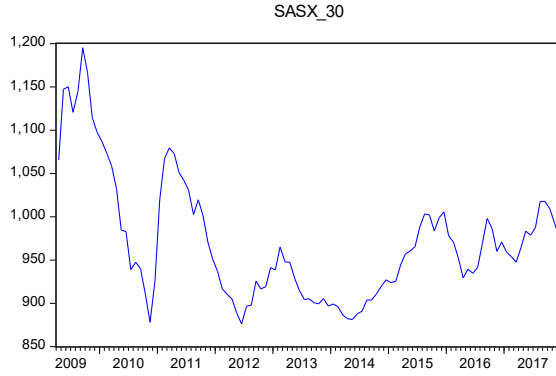
Figure 1. SASX-30 price

SASX_30

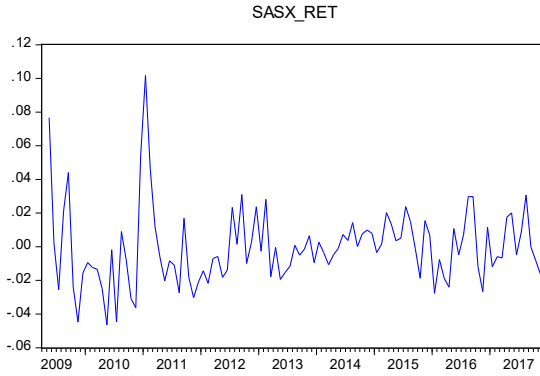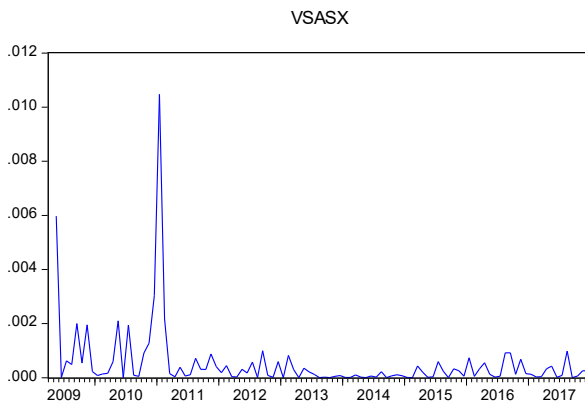**Figure 2.** SASX-30 return rate

SASX_RET

Figure 3. SASX-30 volatility rate

VSASX

In the Figures 4, 5, 6 and 7 graphically presented are values, growth rates and volatility of the macroeconomic variables, namely Consumer Price Index (CPI), Exchange rate, Industrial Production Index (IPI) and Deposit (Interest) rate, used in this study. Time period spans from 2009 to 2017.

Figure 4. Consumer price index value, growth rate and volatility
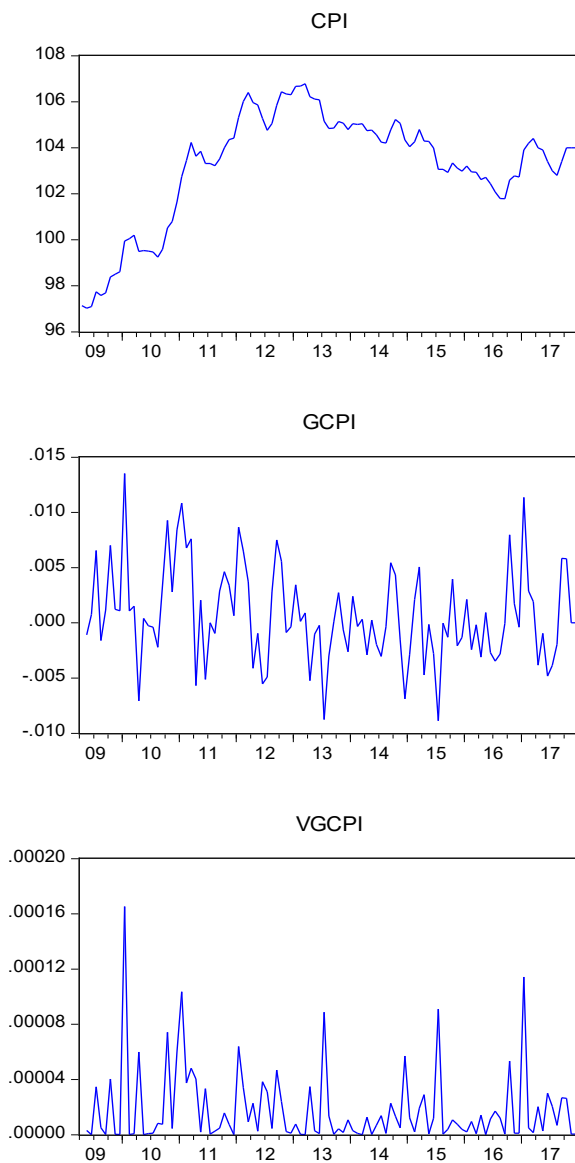
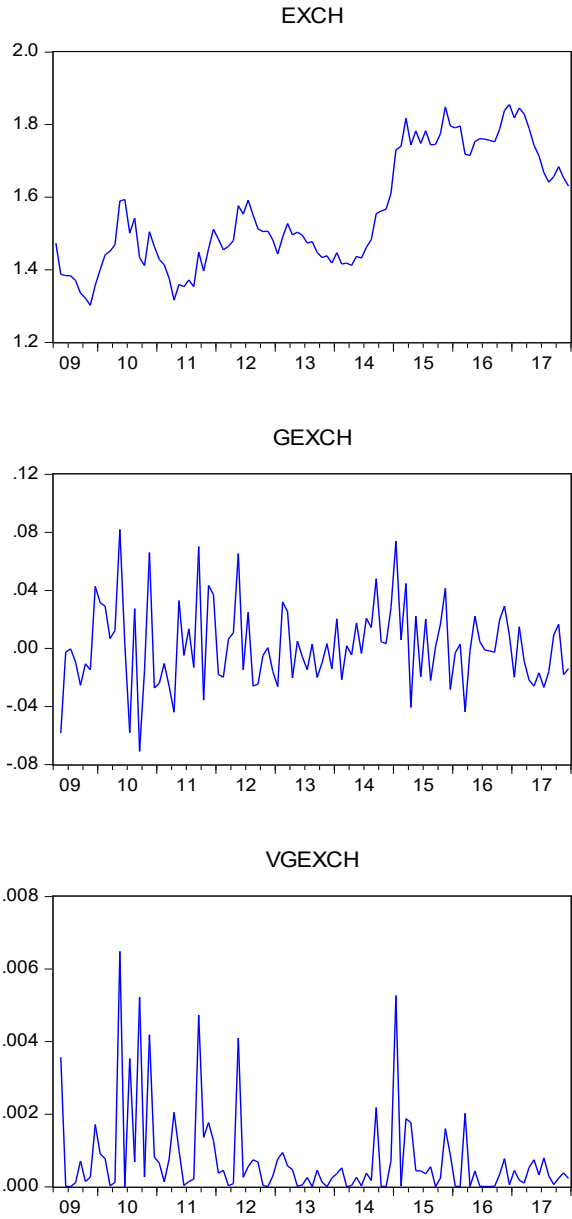**Figure 5.** Exchange rate value, growth rate and volatility

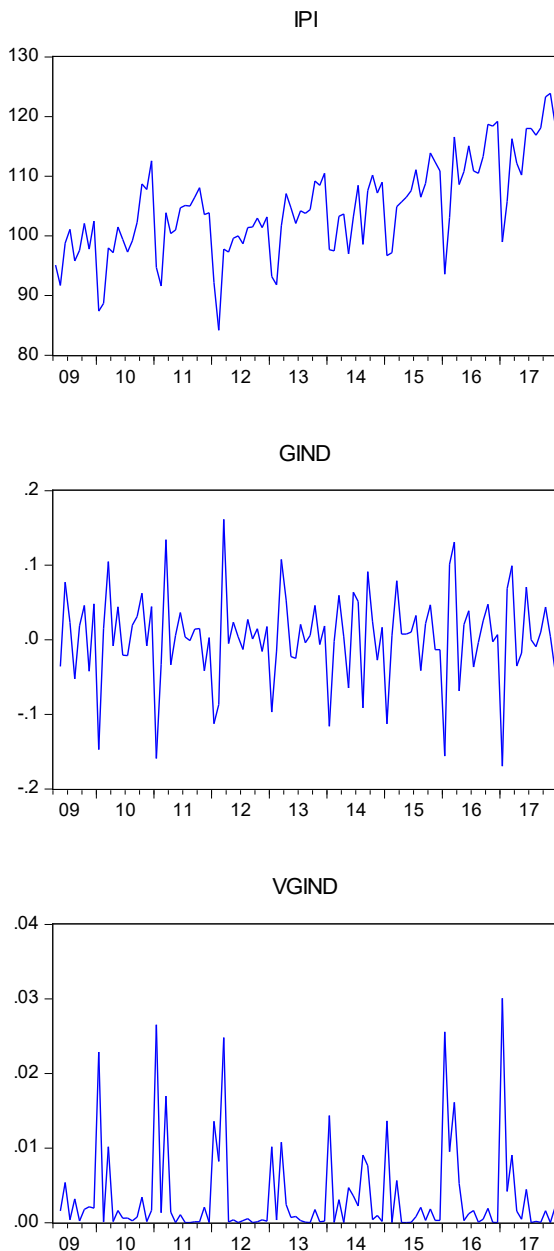**Figure 6.** Industrial Production Index value, growth rate and volatility

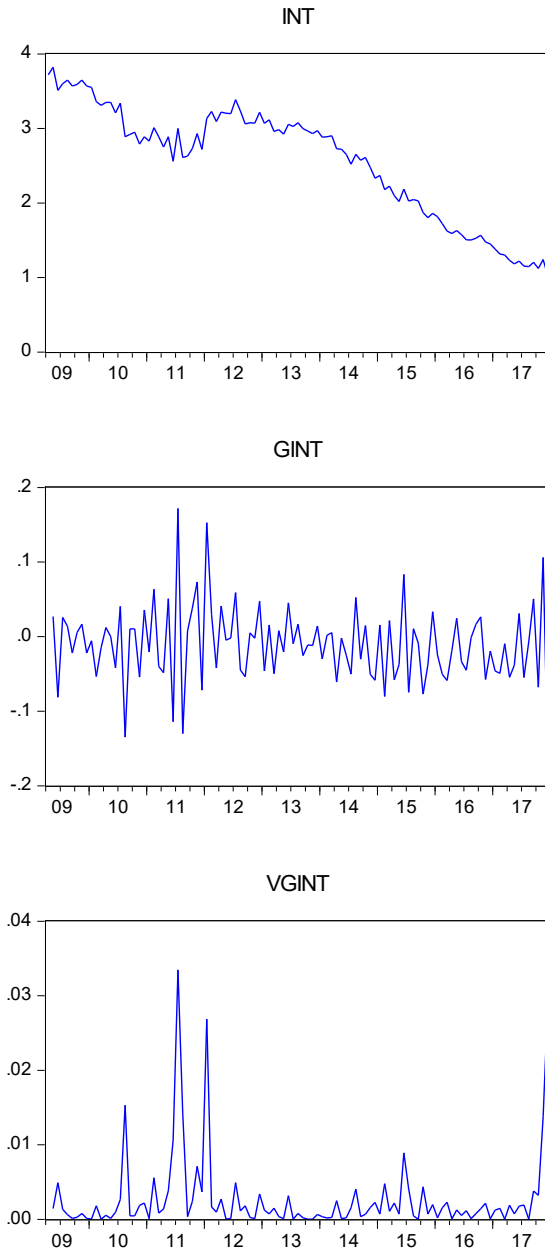**Figure 7.** Deposit rate value, growth rate and volatility

INT

GINT

VGINT

Unit Root Tests

In this section presented are the ADF unit root tests for the variables used in the study.

Unit root test has a crucial importance in the time series analysis as the choice of the techniques and procedure for further analysis and modeling of series depends on their order of integration. Without taking into account the presence of unit root in the variables, the analysis may produce spurious results.[15] So, firstly conducted is Augmented Dickey-Fuller (ADF) test to establish the order of integration for the stock price (SASX-30), exchange rate, industrial production index (IIP), consumer price index (CPI) and deposit rate series. Table 1, Table 2, Table 3, Table 4 and Table 5 show the results of the test, showing that the series are stationary at first difference.

Table 1. ADF Unit root test for SASX-30 return

Null Hypothesis: D(SASX-30) has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=12)		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.859.736	**0.0000**
Test critical values:	1% level	-3.495.021	
	5% level	-2.889.753	
	10% level	-2.581.890	
*MacKinnon (1996) one-sided p-values.			

Table 2. ADF Unit root test for CPI in Bosnia and Herzegovina

Null Hypothesis: D(CPI) has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=12)		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.443.698	**0.0000**
Test critical values:	1% level	-3.495.021	
	5% level	-2.889.753	
	10% level	-2.581.890	
*MacKinnon (1996) one-sided p-values.			

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15   Büyükşalvarcı, A and Abdioğlu, H. „*The Causal Relationship between Stock Prices and Macroeconomic Variables: A Case Study for Turkey*", International Journal of Economic Perspectives, Volume 4, Issue 4, (2010), 601-610.

Table 3. ADF Unit root test for Exchange rate in Bosnia and Herzegovina

Null Hypothesis: D(EXCHANGE) has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=12)		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10,885050	**0.0000**
Test critical values:	1% level	-3.495.021	
	5% level	-2.889.753	
	10% level	-2.581.890	
*MacKinnon (1996) one-sided p-values.			

Table 4. ADF Unit root test for IPI in Bosnia and Herzegovina

Null Hypothesis: D(IPI) has a unit root			
Exogenous: Constant			
Lag Length: 11 (Automatic - based on SIC, maxlag=12)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.052.187	**0.0018**
Test critical values:	1% level	-3.503.049	
	5% level	-2.893.230	
	10% level	-2.583.740	
*MacKinnon (1996) one-sided p-values.			

Table 5. ADF Unit root test for Deposit (interest) rate in Bosnia and Herzegovina

Null Hypothesis: D(INTEREST) has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag=12)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.708.130	**0.0000**
Test critical values:	1% level	-3.495.021	
	5% level	-2.889.753	
	10% level	-2.581.890	
*MacKinnon (1996) one-sided p-values.			

Autoregressive distributed lag (ARDL) model analysis

Autoregressive distributed lag (ARDL) model is used to investigate the relationship between the macroeconomic variables and the stock market index.

Impact of macroeconomic variables on stock market index return

In this part of the analysis presented are the results of the analysis regarding the impact of macroeconomic variables on the stock market index return (SASX-30) in Bosnia and Herzegovina. From Table 6. which shows the results of ARDL model results, the following relationships can be highlighted.

Volatility of exchange rate in Bosnia and Herzegovina has significant immediate negative impact (at 10% level of significance) on stock index return. The result suggests that exchange rate has important role to forecast variance in stock prices.

In several other empirical studies like (Mukherjee and Naka[16]; Fang and Miller[17]; Dimitrova[18]; Rana and Akhter[19]; Geetha, Mohidin, Chandran and Chong[20]; Can Inci and Soo Lee[21]) the authors also found significant relationship between exchange rate and stock market indices.

The other macroeconomic variables do not show significant immediate impact on stock market index return in Bosnia and Herzegovina.

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16   Mukherjee, T.K. & Naka, A. *"Dynamic Relationship Between Macroeconomic Variables and The Japanese Stock Market: An Application of a Vector Error Correction Model",* The Journal of Financial Research, 18(2), (1995), 223-237.

17   Fang, W. & Miller, S.M. (2002). *Currency Depreciation and Korean Stock Market Performance during the Asian Financial Crisis.* Working Paper. University of Connecticut. 30.

18   Dimitrova, D. *"The relationship between exchange rates and stock prices: Studied in a multivariate model",* Issues in Political Economy, 14(1), (2005), 3-9.

19   Rana, M.E., & Akhter, W. *"Performance of Islamic and conventional stock indices: empirical evidence from an emerging economy",* Financial Innovation, 1(15), (2015).

20   Geetha, C., Mohidin, R., Chandran, V. & Chong, V. *"The relationship between inflation and stock market: Evidence from Malaysia, United States and China",* International Journal of Economics and Management Sciences, 1(2), (2011), 1-16.

21   Inci, A. & Lee, B. S. *"Dynamic relations between stock returns and exchange rate changes",* European Financial Management, 20(1), (2014), 71-106.

Furthermore, if we look at the lag 1 of the macroeconomic variables, it can be seen that growth rate of Industrial Production Index (IPI) has slightly negative significant long-run impact on stock index return, after one period (first lag). The results suggest that when Industrial Production Index (IPI) (which is proxy for real economic activity) in Bosnia and Herzegovina is higher, stock market index return (SASX-30) is lower. The result is in line with Buyuksalvarci[22], who finds that Industrial production index in Turkey has a negative effect on Turkish index return.

On the other side, there are several other studies that find significant positive relationship between real economic activity (GDP, IPI) and stock market (Ibrahim[23]; Liu and Shrestha[24]; Sohail and Hussain[25]). However, the result of this study is not in line with economic theory which states that increase in real economic activity would cause rise in stock prices.

Also, the deposit (interest) rate has significant long-run negative impact on stock index return, after one period (first lag). The result suggests when the deposit rate in Bosnia and Herzegovina is higher, stock market index return (SASX-30) is lower. The result is in line with the several prior studies (Dinenis and Staikouras[26]; Jefferis and Okeahalan[27]; Uddin and Alam[28]; Martinez-Moya et al.[29]) who also find significant negative relationship be-

22   Büyükşalvarci, A and Abdioğlu, H., op.cit., 601-610.

23   Ibrahim, M. *"Macroeconomic Variables and Stock returns in Malaysia: An Empirical Analysis".,* Asian Economic Journal, 13(2), (1999), 219-231.

24   Liu, M. H. & Shrestha, K. M. *"Analysis of the long-term relationship between macroeconomic variables and the Chinese stock market using heteroskedasticity cointegration".,* Managerial Finance, 34(11), (2008), 744-755.

25   Sohail, N. and Hussain, Z. *„Long-Run and Short-Run Relationship Between Macroeconomic Variables and Stock Prices in Pakistan The Case of Lahore Stock Exchange",* Pakistan Economic and Social Review, 47 (2): (2009), 183-98.

26   Dinenis, E. & Staikouras, S. K., *"Interest rate changes and common stock returns of financial institutions: evidence from the UK",* European Journal of Finance, 4(2), (1998), 113-107.

27   Jefferis, K. R. & Okeahalam, C. C. *"The Impact of Economic Fundamentals on Stock Markets in Southern Africa",* Development Southern Africa, 17(1), (2000), 23-51.

28   Uddin, G. S. & Alam, M. *"The Impacts of Interest Rate on Stock Market: Empirical Evidence from Dhaka Stock Exchange",* South Asian Journal of Management Sciences, 1(2), (2007), 123-132.

29   Martinez-Moya, P., Ferrer-Lapena, R. & Escribano-Sotos, F. (2013), *Relationship between interest rate changes and stock returns in Spain: a wavelet-*

tween interest rate and stock index return. This result is in line with economic theory, which suggests that increase in interest rate will lead to fall of stock prices, since investors would move their capital to banks.

Table 6. Impact of macroeconomic variables on stock index return in Bosnia and Herzegovina

Dependent Variable: SASX-30-RETURN				
Method: Least Squares		Sample (adjusted): 2009M06 2017M12		
Included observations: 103 after adjustments				
White heteroskedasticity-consistent standard errors & covariance				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
GCPI	-0.713304	0.669053	-1.066.141	0.2894
GEXCHANGE	-0.005307	0.096675	-0.054900	0.9563
GIPI	-0.051929	0.038767	-1.339.523	0.1840
GINTEREST	-0.062970	0.038345	-1.642.211	0.1042
VCPI	1.455.453	1.018.876	1.428.488	0.1568
VEXCHANGE	-3.539.663	1.814.207	-1.951.081	**0.0543****
VIPI	-0.142690	0.515720	-0.276681	0.7827
VINTEREST	-0.361774	0.247871	-1.459.522	0.1481
C	-0.000388	0.004103	-0.094658	0.9248
GCPI(-1)	0.304432	0.601250	0.506332	0.6139
GEXCHANGE (-1)	0.038199	0.077704	0.491600	0.6243
GIPI(-1)	**-0.082328**	**0.035190**	**-2.339.511**	**0.0217***
GINTEREST(-1)	**-0.143090**	**0.046567**	**-3.072.797**	**0.0028***
VCPI(-1)	3.837.132	8.543.259	0.449141	0.6545
VEXCHANGE(-1)	0.086551	1.806.990	0.047898	0.9619
VIPI(-1)	-0.520756	0.382295	-1.362.184	0.1767
VGINT(-1)	0.206699	0.427344	0.483682	0.6299
SASX_RET(-1)	0.292193	0.128416	2.275.361	**0.0254**

*,**: indicates significant at 5% and 10% respectively

From the Table 7. it can be seen that there is no serial correlation in this ARDL model.

based approach, Working Paper, Department of Economics and Finance, UCLM. Spain, 1-24.

Table 7. Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.404.657	Prob. F(2,83)	**0.0966**
Obs*R-squared	5.641.307	Prob. Chi-Square(2)	**0.0596**

Impact of macroeconomic variables on stock market index volatility

In this part of the analysis presented are the results of the analysis regarding the impact of macroeconomic variables on the stock market index volatility (SASX-30) in Bosnia and Herzegovina. From Table 8. which shows the results of ARDL model, the following relationships can be highlighted.

Volatility of exchange rate in Bosnia and Herzegovina is the only macroeconomic variable that shows significant immediate impact (at 10% level of significance) on stock index return. The impact is positive. The result suggests that when the exchange rate is more volatile, volatility of stock index is lower. Rana and Akhter[30] in their study find that exchange rate volatility is significant for the conventional stock market index in Pakistan. Also there are several other studies that found relationship between exchange rate and stock market indices (Can Inci and Soo Lee[31]; Mahedi[32]; Agrawal and Srivastava[33]). The other macroeconomic variables do not show significant immediate impact on stock market index return in Bosnia and Herzegovina. Furthermore, return and volatility of the other macroeconomic variables do not show significant impact on stock index volatility after one period (first lag).

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30   Rana, M.E., & Akhter, W. *op.cit.*, 1(15).

31   Inci, A. & Lee, B. S., *op.cit.,* 71-106.

32   Mahedi, M. *"Impact of the Macroeconomic Variables on the Stock Market Returns: The Case of Germany and the United Kingdom",* Global Journal of Management and Business Research, (2012).

33   Agrawal, G. & Srivastava, A. *"Stock Market Returns and Exchange Rates Volatility: A GARCH Application",* Research Journal of International Studies. 20, (2011), 12-23.

Table 8. Impact of macroeconomic variables on stock index volatility in Bosnia and Herzegovina

Dependent Variable: VSASX-30				
Method: Least Squares		Sample (adjusted): 2009M06 2017M12		
Sample (adjusted): 2009M06 2017M12				
Included observations: 103 after adjustments				
White heteroskedasticity-consistent standard errors & covariance				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
GCPI	0.017181	0.021933	0.783338	0.4356
GEXCHANGE	-0.005965	0.003997	-1.492.558	0.1393
GIPI	-0.003055	0.002386	-1.280.376	0.2039
GINTEREST	0.001268	0.001503	0.843845	0.4011
VCPI	5.250.975	5.445.836	0.964218	0.3377
VEXCHANGE	0.168221	0.085182	1.974.842	**0.0515****
VIPI	0.015808	0.032987	0.479219	0.6330
VINTEREST	-0.012380	0.014069	-0.879986	0.3813
C	0.000154	0.000200	0.769042	0.4440
GCPI(-1)	0.039505	0.030132	1.311.075	0.1934
GEXCHANGE (-1)	-0.003835	0.003168	-1.210.631	0.2294
GIPI(-1)	0.000872	0.001514	0.575991	0.5661
GINTEREST(-1)	0.002032	0.001818	1.117.617	0.2669
VCPI(-1)	5.603.033	5.019.733	1.116.201	0.2675
VEXCHANGE(-1)	0.000761	0.063160	0.012050	0.9904
VIPI(-1)	-0.027583	0.023296	-1.184.011	0.2397
VINTEREST(-1)	-0.011285	0.021341	-0.528799	0.5983
VSASX(-1)	0.207367	0.123321	1.681.524	**0.0963**

**: indicates significant at 10%

From Table 9. it can be seen that there is no serial correlation in this ARDL model.

Table 9. Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.281.767	Prob. F(2,83)	**0.1085**
Obs*R-squared	5.368.035	Prob. Chi-Square(2)	**0.0683**

Significance and Contribution of the Study

There are numerous empirical studies regarding impact of macroeconomic variables on stock indices around the world. However, this study, is to our best knowledge, first and pioneer empirical study regarding the impact of macroeconomic variables on stock market index in Bosnia and Herzegovina. Therefore, it can be stated that the study partially fills the gap regarding the empirical investigation of relationship between macroeconomic variables and stock market index in Bosnia and Herzegovina.

Furthermore, this study contributes to the existing international literature regarding stock indices behaviour, and their relationship with macroeconomic variables.

Also, this study provides valuable information to the potential investors, who can better understand the behaviour of the stock index, based on their relationship with the four macroeconomic variables in Bosnia and Herzegovina.

Limitations and Future studies recommendation

As one of the limitation of this study is the number of macroeconomic variables used in this research. The reason for this limitiation is the availability of data. Therefore, in the future studies, this model should be enriched with more macroeconomic variables including unemployment rate, export and import value, money supply etc.. In this case, in the future studies there could be more comprehensive results. The behaviour of stock index would be described more comprehensively.

Furthermore, the future studies can also observe eventual impact of stock index in Bosnia and Herzegovina on the macroeconomic variables. In this way, the impact of stock index on macroeconomic variables could be understood.

CONCLUSION

This paper extends our knowledge about relations among macroeconomic variables stock market indice. The aim of this research was to investigate eventual impact of macroeconomic variables on stock market index (Sarajevo Stock Exchange Index 30) return and volatility in Bosnia and Herzegovina. The set of macroeconomic variables includes; Consumer Price Index (CPI), Industrial Production Index (IPI), exchange rate and deposit (interest) rate, which are obtained from International Monteray Fund database. In order to examine the impact, conducted is the autoregressive distributed lag (ARDL) model. Monthly data from 2009 to 2017 is used to find out the eventual impact.

Firstly tested was stationarity of the variables (time series) used in the study. By applying Augmented Dickey-Fuller (ADF) test we found out that their first differences are stationary and so the variables are integrated first order.

The results of the study show that volatility of exchange rate in Bosnia and Herzegovina has significant impact (at 10% significance level) on stock index return and volatility. Furthermore, the results show that the deposit (interest) rate and Industrial Production Index (IPI) have slightly negative significant long-term impact on stock index return. The other macroeconomic variables do not show any significant impact on stock market index return and volatility (SASX-30) in Bosnia and Herzegovina.

This implies that the exchange rate, Industrial Production Index (IPI) and deposit (interest) rate can be used as indicators to describe behaviour and movement of stock market index in Bosnia and Herzegovina.

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UTJECAJ MAKROEKONOMSKIH VARIJABLI NA BERZANSKI INDEKS U BOSNI I HERCEGOVINI

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Abstrakt

Veza između makroekonomskih varijabli i berzanskih indeksa je kvalitetno dokumentovana i podrobno istražena širom svijeta. Međutim, postoji određena praznina kada je u pitanju literatura koja istražuje vezu između makroekonomskih varijabli i berzanskih indeksa u Bosni i Hercegovini. Imajući to u vidu, ovaj rad se bavi istraživanjem uticaja makroekonomskih varijabli u Bosni i Hercegovini na berzanski indeks (SASX-30). Rezultati ovog istraživanja pokazuju da volatilnost deviznog kursa u Bosni i Hercegovini ima značajan uticaj (na osnovu 10%) na povrat i volatilnost berzanskog indeksa. Nadalje, rezulati također pokazuju da depozitna (kamatna) stopa i indeks industrijske proizvodnje imaju blago negativan dugoročni uticaj na povrat berzanskog indeksa (na osnovu 5% nivoa signifikantnosti).

Ključne riječi: *SASX-30, makroekonomske varijable, povrat, volatilnost, BiH*