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Impact of stock market development on economic growth: empirical evidence

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Abstract

Development of non-oil sector of Azerbaijan was always one of the main priorities of the government. Oil sector of the economy was well developed since Azerbaijan got its independence, but in order to use the oil source more effectively it was determined to diversify the funds into non-oil sector of the economy, which in the end gave huge boost to most industries of the economy and led to increase of foreign direct investment. However, another source of the foreign direct investment and investor attraction – stock markets, were not developed and organized properly up until 1998, which was mainly due to outdated procedures left from USSR, absence of principles, methodology and understanding of how stock market can play huge role in expansion of economy and attraction of foreign investment. Nowadays, Azerbaijan has all possibilities to widen the stock market, enable easy way of increasing number of small businesses, startups and open the doors for them to global economy and lead to speedy expansion of the businesses.

This research analyses the possible relationship between stock market development and economic growth, in order to predict possibility of positive impact of stock market on economic growth, overall social economic welfare of the country and business environment. For the purposes of the research, statistical figures of the country`s main economic indexes were collected: gross domestic product value, foreign direct investment value, stock market liquidity and turnover values, which were then analyzed and tested on various levels of cointegration test, Granger Causality test, vector error correction model and etc. All the analysis were done on statistical software Stata 11 based on figures of 1998-2016.

The outcome of the Johansen-Julius shows existence of cointegration and by that VECM test proves relationship between stock market and economic growth in long run, while Wald Test confirms correction of this growth in short term by given explanatory variables. Hence, Granger causality test is conducted further, which determines bidirectional relationship between 3 variables: foreign direct investment, GDP and LIQ (stock market liquidity level). Based on the outcome of the analysis, study concludes that expansion of stock market and increase in

foreign direct investment will have chain effect which leads to economic growth and social welfare in Azerbaijan.

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Introduction

Recent theoretical studies have already identified that financial sector of the country is one of the driving forces behind its economic growth. Increasing interest in financial markets and their expansion throughout the countries once more proves their importance in sustainable economic growth. These theories were already investigated and the link between economic welfare and income was found in different studies conducted by Gurley and Shaw (1955, 1960, and 1967). [1, 2, 3] Same approach was used by Goldsmith (1969), who found out that expansion of financial markets throughout the country leads to sustainable economic growth and welfare, which was shown in the research conducted among 35 countries. [4] This evidence was then supported by research of World Bank (1989), which found strong relationship between macroeconomic and financial indexes of the investigated countries. [5]

In theory the rise of GDP is strongly associated with new goods, technological evolutions and revolutionary processes (Solow, 1956), as a result it leads to capital allocation from areas where capital has excess to the areas where it can be used for economic and financial benefit (Levine, Loayza and Beck,2000). [6] Great role in this capital allocation for the growth of GDP inheres to financial intermediaries, which become a "bridge" between subjects of the economy of country. [7]

One of these financial intermediaries are stock markets, which recently become one of the main indicators of world economy. Moreover, the biggest financial crisis of 20th and 21st century – The Great Depression (1929) and Financial Crisis (2008), were strongly associated and predicted through stock markets, which inevitably proves powerful impact of market on the macroeconomic indexes of the country, mainly GDP as main indicator. Garcia and Liu (1999) in their research concluded that through three main lines stock market (financial intermediaries) can be driving force for economic growth. [8] First of all, stock markets play role of assistant for efficient allocation of capital investments by providing participants of stock markets with fair and accurate financial information, this leads to more attraction of investors and stimulates savings.

Secondly, the attraction of investors is obtained also through providing higher yields on investments, this motivates owners of capital to refuse from keeping savings out of economy and leads to investments, the results of this process is proper flow of investments and optimized usage of capital. Lastly, higher volume of capital investments provided by financial intermediaries leads to ease of access to the finance of subjects of economy, which saves them from banks and high interest borrowings.

Stock markets were started forming in post-soviet countries in late 90-s, just as they got their economic independence. However, due to being part of USSR which already had specific financial infrastructure and policy without stock market, most of them had similar key challenges in order to create base for it. Nowadays, CIS countries have well developed stock markets which can be seen from the figures of International Association of CIS Countries Stock Exchange where capitalization of markets gets to 890 billion dollars (London Stock Exchange, 2018). Hence, considering rapid growth of their economy, CIS countries are becoming one of the strategically significant players in the world stock trade as one of the attractive placements for investment.

Despite, Azerbaijan being one of the most developed and economically sustainable countries, being dependent from oil resources led to late establishment of financial institutions inside of the country. Although, first sights of stock market subjects can be noted back in the history of Azerbaijan Democratic Republic, where promissory notes were issued and traded among wealthy part of the country. However, after losing its independence local notes were banned from being issued and therefore stock market growth got to temporarily stuck. In 1998 after foundation of State Committee of Securities of Azerbaijan and registering as full chairman in the National Depositary System, stock market history of Azerbaijan Republic have re-established (SCS Azerbaijan, 2018). Year later in 1999 Baku Stock Exchange (BSE) first ever stock exchange of Azerbaijan after presidential decree on "Providing the activity of State Committee for Securities under the auspices of the President of Azerbaijan Republic" was found and began its operations in September, 2000[12]. [9]

Simultaneously, Azerbaijan began associative work with other developed in stock market European countries and organizations, in order to exchange experience and improve infrastructure. As a results, European Union started project "Development of Stock Market in Azerbaijan" which included legislative, technical and physical improvements in the markets system of Azerbaijan SCS

[1] Azərbaycan Respublikasının Dövlət Statistika Komitəsi. Retrieved November 26, 2018, from http://www.stat.gov.az/

[2] State Committee for Securities of Azerbaijan Republic. (n.d.). Retrieved November 26, 2018, from http://www.scs.gov.az/

(SCS Azerbaijan, 2018). Nowadays, the BSE has turnover equal to 13.62 billion AZN as per statistics for 2017 which is 2.4 times higher than in 2016 (website, 2018). [10] In total stock market has shown increase from traded shares value of 20, 246 $ in 1998 to 8 billion $, which proves that market expands yearly and interest in its development is becoming one of the priorities of local government (SCS Azerbaijan, 2018).

Additionally, government begun using market as support for its own borrowings as well, e.g. 2016 SOCAR – main oil regulatory company of Azerbaijan Republic issued USD bonds total valued in 100 million USD for 5 years with 5% interest rate (SOCAR Azerbaijan, 2018). It was done in order to get access to savings of the population, assist people to earn on interest rate and solve internal financial issues of the company without going to different foreign debt or bank organizations. Hence, SOCAR bonds are also one of the traded ones locally in BSE and give the owner not only interest rate of 5%, but also additional income while being traded in the local market.

As it can be seen financial market started playing notable role in economy of Azerbaijan, while usage of the BSE started giving advantages to local companies in getting access to monetary funds. On the other hand, at the end of 2016 president Ilham Aliyev signed decree on endorsing "Strategic road maps for the national economy and main economic sectors" which mainly focused on improvement of non-oil sector of economy in order to gain additional tunnels of funding. Local markets as part of alternative income can be expanded and by that give great boost to economy of the republic.

Considering above, possible relationship between stock market expansion and GDP growth may exist, which requires additional examination in order to find it. Therefore, this research is going to analyze based on statistical methods causal relationship between stock market and macroeconomic indexes of Azerbaijan Republic. As there was only research conducted to analyze relationship between FDI and stock market in Azerbaijan (Aliyev, 2018) and no analysis of GDP and stock market, this research is going to be first to investigate this possible link between main macroeconomic indexes and stock market performance indicators.

Literature Review

Over the past few decades number of researches were conducted in order to analyze possible causal relationship between stock markets (or other financial intermediaries e.g. foreign direct investment) and economic growth rates. Although, the results were different, significant number of studies showed that variables of these two macroeconomic indicators have strong causal relationship in long term. Similar results were achieved in the research of Bencivenga and Smith

(1991), where role of financial intermediaries as boosters of economic growth was proved. Their results indicate that through financial intermediaries it`s possible to relocate savings or financial surplus into areas where there is shortage, and by that increase efficient usage of capital. Another vital advantage given by stock markets is risk diversification and increase of liquidity, which were discussed in the investigations of Levine (1996), Obstfeld (1994). [10, 11] Their results align with common belief that intermediaries increase proficiency of the economy by providing investors with accurate and required data for right decisions, by that role of stock markets as primary source of information increases. Reports confirming increase of liquidity level by accurate and timely information were achieved in the investigations by Greenwood and Smith (1997), Holmstrom et al. (1998). [12, 13] Their findings were later supported by Garcia and Liu (1999), who explained efficient role of financial markets in economic growth through three channels: by reducing transaction cost of information – this was also later supported by Paudel (2005); providing investors with higher returns in order to stimulate their mind in to allocating their resources and by that shift capital surplus to the areas where is shortage and by that optimize capital allocation. [14]

Liquidity is another advantage given by stock markets, which gives smooth resource allocation of capital and easy access to funding for new business and companies. This was shown in the study conducted by Paudel (2005), who distinguishes stock markets as main source of finance and assistant for the firms. [15] Several studies over countries macroeconomic indexes, mainly between financial and economic show existence of correlation between them and therefore, one of them can always be a good predictor for another one. Bahadur and Neupane (2006) through analyzing stock market fluctuations and economic indexes, found that stock markets can be used as a good predictor of growth. [16] Big crashes of the economy in the world which happened in 1929 and 2008, were both predicted by stock market downfalls, which again proves theory that financial intermediaries are good predictors of economic growth. Another form of liquidity is risk diversification given by stock markets, which enables investors with number of choses in investment channels and by that increase the possibility of efficient resource allocation. Studies examining risk diversification theory confirmed the existence of this linkage, which can be seen from the researches of Obstfeld (1994), Saint-Paul (1992), Deveraux and Smith (1994). [17, 18] Due to ease of access to the information by investor, he is able to make appropriate investment and lower risk of being wrong, which will lead to economic growth, eventually (Stiglitz and Weiss, 1981). [19]

Findings were further developed in the studies of Abu (2009) who through using error correction model examined variables from 1970 to 2007 and found out a positive relationship between stock market and economic growth. [20] His results

showed strong bidirectional relationship and concluded that increase in stock markets can lead to economic growth of the country. Similar positive relationship was found in the results of Dep and Mukherjee (2008), who by applying Granger-Causality test found similar causality between market and growth terms of the economy. [21] Although, most of the researches are in line with literature that stock market has strong impact on economic growth, we cannot diminish also effect of banking. His results showed notable impact of banking sector on economic growth as well, however the results were much more showing dependence rather than precedence. This shows that possibility of having bidirectional relationship is higher than mono, which means that these two macroeconomic indexes complement each other. Robust results were also found in the research conducted by Shahbaz et al. (2008), who by using Granger causality test concluded existence of long run relationship between stock market and economic growth. [22]

In terms of Azerbaijan, first research in this area was conducted by us, who examined possible causal relationship between FDI and stock market. [23] These results were align with previous literature and found unidirectional relationship coming from stock market, which means that expansion of stock markets may lead to FDI inflow into the country. Considering that FDI itself has strong impact on economic growth of the country through bringing additional capital in to the economy, this research indirectly proves possibility of having strong relationship between stock market and economic growth in Azerbaijan (Aliyev et al., 2018).

Methodology

Data

This study examines causal relationship between stock market and economic growth in Azerbaijan between 1998-2016 years' time frame. Data for the purpose of analysis was collected from several sources: Baku Stock Exchange, World Bank Data, Azerbaijan State Statistics Committee and Azerbaijan Stock Exchange web-resources. The variables chosen for further statistical and macroeconomic analysis are following:

LGDP = log of gross domestic product

LFDI = log of foreign direct investment into the country in USD currency

LLIQ = log of total volume of traded shares in the stock market as indicator of liquidity level of the market

LMT = log of total volume of market turnover, calculated as total volume of shares divided by total market capitalization

Logarithms of each variable were taken to linearize the trend which growth exponentially, this also eases the process of statistical analysis with variables which have high figures (Asteriou and Price, 2007). Data set used for the purpose of analysis covers time frame between 1998 and 2016, which is actually from the beginning of the stock market foundation in Azerbaijan and till last year of available data for the research.

Model

In functional form the analysis of the variables statistically can be shown based on the formula below:

(1)) GDP= f (FDI, LIQ, MT)

It can be seen that dependent variable is GDP, which is analyzed through macroeconomic indexes like FDI, LIQ and MT. However, for the easiness of the analysis and to diminish exponential trend of the variables logarithms of each variable was used. The statistical software used for the analysis of the variables was Stata 11.

Empirical analysis methods

Unit Root Test

In the analysis of time series data it is essential for the variables to be cleared from time dependence and make them stationary. If non-stationary data is used in the statistical analysis it leads to spurious results and cannot be used in future forecasts (Dickey-Fuller, 1979). Hence, it is important to perform stationary test on the variables in order to get to more accurate figures and for that purpose Augment Dickey-Fuller or Philips-Perron tests can be used. Functional form of unit root test can be shown below:

$$(2))\ \Delta y_t = \alpha + \beta_t + \lambda y_{t-1} + \delta_1 \Delta y_{t-1} + \cdots + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t$$

Considering that stationarity of the variables is one of the essential points of time series analysis, the research starts with performing Augment Dickey-Fuller and Philips-Perron tests over the variables. The level of differentiation of each variable is denoted as I (d), which means that following variables for differenced "d" times in order to get to stationarity. If variable gets to stationarity without

being differenced, this is shown as I (0). These tests are vital part of time series analysis, in order not to give false results in short term or long term cointegration analysis. The level of accepted lag length in the research is calculated based on Schwarz (SIC) and Akaike (AIC) criterion.

Cointegration Test

When stationarity of the variables is established the analysis continues with determination of long run relationship between explanatory and dependent variables. For this purpose Johansen-Julius (1988) test is used, which through estimation of trace statistics (likelihood ratio) and statistical rank determines long run relationship between variables. However to run this test, the variables must be denoted at the same order to diminish possibility of giving spurious results. Hence, the test is conducted straight after establishing the stationarity of the variables. Functional form of the test for the calculation can be presented as following:

$$(3)) \; Y_t = \mu + \Delta_1 Y_t - 1 + \cdots \Delta P Y_t - p + \varepsilon_t$$

Main indicator of Johansen-Julius (1988) test is trace statistics, also noted as likelihood ratio which determines the significance level of each coefficient and minimum number of cointegrated vectors:

$$(4)) \qquad \lambda_{trace} = -T\Sigma \ln(1 - \lambda_t)$$

Another method of cointegration analysis is determining the max number of eigenvalue (Hjalmarsson, 2007), which is as below:

$$(5)) \qquad \lambda_{max} = -T \ln(1 - \lambda_t)$$

Main purpose of trace statistics, where T is sample size and λ is calculated eigenvalue, is to find out number of linear combinations which equal to a given value. Null hypothesis for the test is absence of cointegrated variables, against which the significance level of variables is calculated and null hypothesis is rejected, showing the existence of at least one cointegrated variable in the equation.

Vector Error Correction Model

Having found at least one cointegrated variable, the research continues with analysis of possible short and long run relationship between variables. For this purpose vector error correction model is used, which investigates possibility of relationships between variables and also calculates the speed of adjustment from disequilibrium to equilibrium which in this case is GDP. VECM term is calculated based on below formula:

(6)) $\Delta y_t = \delta + \delta y_{t-1} + \Sigma\Phi_i * \Delta y_{t-1} + \varepsilon_t$

Considering the variables, the formula can be described as following:

(7)) $\Delta GDP_t = \delta + \rho y_{t-1} + \Sigma\Phi_i * \Delta FDI_{t-1} + \Sigma\Phi_i * \Delta LIQ_{t-1} + \Sigma\Phi_i * \Delta MT_{t-1} + \varepsilon_t$

Main outcome of VECM test is to achieve statistically significant error term, which proves existence of long run relationship between explanatory variables and dependent one. As for the investigation of short run relationship Wald test is performed giving condition that "if all explanatory variables are jointly equal to zero" which is null hypothesis for this test, while the results are calculated based on chi squared and probability values. Moreover, another index of VECM test is R squared term, which estimates goodness of the fit of the model and the level the variables explain the model. The higher the value of R squared, the more model is fit and variables explain it, however in some cases existence of correlation between the variables may also lead to higher level of R squared term. Hence, the variables are tested for auto-correlation, in order to clear possibility of its existence among the variables which can lead to spurious results.

Granger-Causality Test

Finally, to investigate the direction of relationship of cointegrated variables in the research Granger-Causality test is conducted (Granger, 1969). This test was developed by Granger (1969) primary function of which is to examine direct of impact between cointegrated variables. Results are presented by probability level of each which shows the significance of the variables in the model based on maximum 5% critical value. The functional equation of the test can be presented as following:

(8)) $x_t = \alpha_0 + \sum_{i=1}^{n} \alpha_i \; x_{t-i} + \sum_{j=1}^{m} \beta_j \; y_{t-j} + u_t$

(9)) $y_t = \alpha_0 + \sum_{i=1}^{n} \beta_i \; y_{t-i} + \sum_{j=1}^{m} \alpha \; x_{t-j} + \varepsilon_t$

As it can be seen from the formula above, in order to find out whether Y can Granger cause X (Formula 1), then past values of X and Y should be used to predict X. In other words, if Y can Granger cause X and can be used as predictor of X, then value of the coefficient β in Equation 1 must be different from 0. Then it can be said, that Y can be used as predictor and may Granger cause X. Same can be applied to Equation 2, where coefficient α must be significantly different from 0 so it can be said that X can Granger cause Y. Hence, in case if both of the coefficients are equal to 0, then there are no any causality relationship existence can be found.

Estimation and results

Summary of the variables

Table 1. Summary of the values of the variables

Variable	Observations	Mean	Std. Dev.	Min	Max
Years	19	2007.00	5.63	1998.00	2016.00
LGDP	19	24.23	0.56	23.30	24.81
LFDI	19	20.73	2.23	14.51	22.42
LLIQ	19	13.70	2.32	9.91	16.03
LMT	19	-0.88	1.35	-3.20	0.98
DLGDP	18	0.84	0.09	-0.46	0.30
DLFDI	18	0.36	1.29	-1.37	5.05
DLLIQ	18	0.31	0.71	-1.02	1.72
DLMT	18	-0.08	1.24	-3.49	1.98

Table 1 summarizes the values of the variables investigated in the research. As it can be seen the minimum value for variable “Years” equals to 1998 while maximum is 2016, which follows the given purpose of analyzing the relationship of stock market on GDP in this time frame. Variables used in the research are explained below:

LGDP – log of gross domestic product, **LFDI** – log of foreign direct investment into the country, **LLIQ** – total number of traded shares in the market divided by market capitalization as index of liquidity, **LMT** – log of market turnover as total number of shares traded in the stock market.

As it can be seen from the variables used, research initially takes logs of each variable to linearize the growing exponentially trend of the values. Afterwards, in order to get to stationarity 1st order of integrations of each variable

was taken and denoted by "D" letter in the beginning of each name. It can be seen that after their differentiation to 1st order of integration the value of "years" gone 1 value down, which is due to first year in the differentiated variables being equal to "0" after subtraction. Table 1 also shows the calculated values of mean and standard deviation for information purposes.

Unit Root Tests

Analysis of the relationship between variables stars with their stationarity test, in order to escape possibility of getting spurious results. For that purpose two stationarity tests are used developed by Dickey-Fuller and Philip-Perron. Both tests results are examined based on 5% critical value by given null hypothesis "there is no stationarity between the variables", and if the probability levels are significant statistically then the research rejects the null hypothesis and accepts alternative hypothesis that "there is stationarity between the variables".

Table 2. Augmented Dickey-Fuller and Philip-Perron unit root tests.

Variables	PP			
	Level		1st Difference	
	Constant and no trend	Constant and trend	Constant and no trend	Constant and trend
LGDP	-1.643 (0.4609)	-0.369 (0.9878)	-3.152 (0.0229)*	-3.699 (0.0224)*
LFDI	-2.772 (0.0625)	-2.137 (0.5251)	-5.380 (0.00)**	-7.119 (0.00)**
LLIQ	-1.517 (0.5252)	-1.207 (0.9090)	-3.062 (0.0295)*	-3.766 (0.045)*
LMT	-1.764 (0.3985)	-1.285 (0.8917)	-4.283 (0.00)**	-4.501 (0.00)**

Variables	ADF			
	Level		1st Difference	
	Constant and no trend	Constant and trend	Constant and no trend	Constant and trend
LGDP	-1.716 (0.4229)	-0.260 (0.9904)	-3.145 (0.0234)*	-3.712 (0.0216)*
LFDI	-2.346 (0.1575)	-2.330 (0.4175)	-5.614 (0.00)**	-7.476 (0.00)**
LLIQ	-1.522 (0.5227)	-1.055 (0.9363)	-3.108 (0.0260)*	-3.686 (0.046)*
LMT	-1.733 (0.4140)	-1.266 (0.8961)	-4.275 (0.00)**	-4.452 (0.0018)**

Note: * and ** show significance level of the test results, showing 5% and 1% significance level respectively. MacKinnon critical values for rejection of null hypothesis are equal to -3.75 and -4.38 for absence of trend and presence of trend respectively.

As it can be seen from the Table 2, neither of the variables are stationary at their levels but given their 1st difference values, they become stationary at 1% and 5% respectively. Hence, 1st difference values of the variables can be used for further analysis as they got to stationarity and follow the results of other researches.

Johansen-Julius Cointegration Test

Having established stationarity among the variables research continues with investigation of possible long run relationship between them. In order to test long run relationship, Johansen-Julius test is conducted which by using eigenvalues and maximum eigenvalues of the parameter analysis existence of long run relationship between the variables. In order to run this test maximum lag length was determined for the model based on Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC) equal to 2. The results of the test can be seen in the Table 3 below:

Table 3. Johansen-Julius Cointegration Test Results (Cointegration Rank).

Hypothesis:	Likelihood Ratio (Trace Statistic)	1% Critical Value	5% Critical Value
H_0 = no any cointegration among the	74.70**	54.46	47.21

variables			
H_0 = at most 1 cointegration among the variables	27.15	35.65	29.68
Hypothesis:	**Likelihood Ratio (Max Statistic)**	**1% Critical Value**	**5% Critical Value**
H_0 = no any cointegration among the variables	47.54**	32.34	27.07
H_0 = at most 1 cointegration among the variables	18.09	25.52	20.97

Note: * and ** show significance level of the test results, showing 5% and 1% significance level respectively. Test results in cointegration outcome for 3 variables at 1% critical level.

As it can be seen from Table 3, results of the analysis prove the existence of long run relationship between the variables. Initial analysis of the test examine the null hypothesis of "no any cointegration among the variables" which results in significant trace statistics value (at 1% probability level) which means research can reject null hypothesis and accept alternative hypothesis that there is cointegration among the variables. Furthermore, the analysis of second null hypothesis that there is "at most 1 cointegration among the variables" cannot be rejected rather than accepts null hypothesis, meaning that there is 1 cointegration among the variables. The final results lead to conclusion that there are 3 cointegrated variables in the model in given time frame and this follows the results of previous literature.

Hence, the variables show long run relationship between them and can be tested on probability of either unidirectional or bidirectional impact.

Vector-Error Correction Model

Finally, cointegrated variables are tested on presence of long run or short run relationship in given time frame. For this purpose, VECM model was developed based on given variables, as it can be seen in the Table 4:

Table 4. VECM model for long run relationship analysis (results).

Dependent Variable: GDP		**R-squared: 0.8441** **Log likelihood: 247.98** **Akaike AIC= -27.33** **Schwarz SC= -25.30** **P>chi2= 0.0025****		
Error Correction	**Coefficient**	**Standard Error**	**Probability Level**	**z**
Cointegration Equation	-1.3980451	0.5783491	0.007**	-2.41
DLGDP (1 lag)	1.1343474	0.3720332	0.001**	3.05
DLGDP (2 lags)	-0.9274471	0.2297733	0.000**	-4.03
DLFDI (1 lag)	-1.0495501	0.0426917	0.000**	-24.58
DLFDI (2 lags)	0.9171628	0.337317	0.003**	2.71
DLLIQ (1 lag)	-1.0076869	0.2426127	0.000**	-4.15
DLLIQ (2 lags)	-0.935917	0.2398728	0.000**	-3.90
DLMT (1 lag)	-0.0031892	0.0202112	0.875	-0.16
DLMT (2 lags)	0.016682	0.0323278	0.606	0.52
_constant	0.0047279	0.0256966	0.854	0.18

Note: * and ** show significance level of the test results, showing 5% and 1% significance level respectively.

As it can be seen from the results, error term is negative and statistically significant at 1% level which follows previous literature. Moreover, negative

coefficient of error term -1.39 means that variables of the model correct disequilibrium in short run each year by 139% towards equilibrium. Statistically significant variables of FDI and LIQ prove that both of them have impact on GDP, hence may lead to growth of it in long run and short run. Model fitness level is at 85% which can be seen from the outcome of R-squared term, while probability level chi-squared of dependent variable GDP is statistically significant at 1% level.

Additionally, to test the possibility of short run impact of explanatory variables, research also runs Wald test. Primary function of Wald test is by using null hypothesis that "all explanatory variables in the model are jointly equal to 0", find out the level of impact they have in short run on dependent variable.

Table 5. Wald short run test of explanatory variables.

Short Run Test Analysis of jointly impact of variables on dependent variable GDP		
1	[D_DLGDP]LD.DLFDI	equal to zero
2	[D_DLGDP]L2D.DLFDI	equal to zero
3	[D_DLGDP]LD.DLLIQ	equal to zero
4	[D_DLGDP]L2D.DLLIQ	equal to zero
5	[D_DLGDP]LD.DLMT	equal to zero
6	[D_DLGDP]L2D.DLMT	equal to zero
$chi_2(6) = 27.03$ **Probability > $chi_2 = 0.001$****		

Note: * and ** show significance level of the test results, showing 5% and 1% significance level respectively.

Table 5 results show that null hypothesis can be rejected at 1% critical value level meaning that in short run the explanatory variables have an essential influence on GDP growth level.

Considering that R-squared term is quite high, variables must be also tested on possibility of serial correlation which in some cases can be the reason of high R-squared term. Therefore, Durbin-Watson test on serial correlation was conducted to test this possibility:

Table 6. Durbin-Watson test on serial correlation.

Durbin's alternative test for autocorrelation			
lags(p)	**chi-squared level**	**Degree of freedom**	**Probability > chi-squared**
3	**0.093**	**1**	**0.7608**
H0: no serial correlation			

As it can be seen from the results of Table 6, probability level of chi-squared term is more that the lowest critical value, which means that research cannot reject the null hypothesis rather than it accepts, meaning that there is no serial correlation among the variables tested in the model.

Granger Causality Test. Estimation of impact direction in explanatory and dependent variables.

Final step of the research after long run and short run relationship between the variables being found, is to check whether this relationship is unidirectional or bidirectional. For that purpose, Granger Causality test was conducted to examine possibility of each variable to predict other one given the time frame and data available. The results of the test are shown in the Table 7:

Table 7. Granger Causality Test Results

Null Hypothesis	Observations	F-Statistics	Probability
GDP does not granger cause FDI	19	26.68	0.000**
GDP does not granger cause LIQ	19	9.01	0.029*
GDP does not granger cause MT	19	5.3581	0.147
FDI does not granger cause GDP	19	17.52	0.001**
LIQ does not	19	8.1662	0.043*

granger cause GDP			
MT does not granger cause GDP	19	5.5498	0.136

Note: * and ** show significance level of the test results, showing 5% and 1% significance level respectively.

As it can be seen in 4 cases F-statistics and probability level show significance, which allows to reject null hypothesis at 1% and 5% respectively, and accept alternative one that those variables "does Granger cause the other one". Gross domestic product, foreign direct investment and liquidity level of market have bidirectional relationship between each other in long run and short run. This proves that development and expansion of foreign direct investment and stock market in Azerbaijan, can lead to growth of GDP and eventually increase social-economic welfare of the country. The results are in line with previous literature and another research of relationship between FDI and GDP in Azerbaijan (Aliyev, 2018), which is a navigation for current government to develop stock market in Azerbaijan and gain more investors into the country. This is also in line with President of Azerbaijan Republic policy of re-directing funds received from oil sector into expansion of other sector of economy of the country and by that get to rational balance economic growth and social welfare.

Conclusion

This study investigated possible relationship between stock market development and economic growth within 1998-2016 time span in Azerbaijan. For this purpose relative data of FDI, stock market liquidity, stock market turnover and GDP figures were collected and analyzed. Collected data was examined through statistical tools primarily by developing Johansen-Julius cointegration test and VECM model, which showed existence of relationship between stock market development and economic growth in short and long term. Data was further analyzed for determination of direction of impact based on Granger causality test, which found out bidirectional relationship between FDI, GDP and stock market liquidity variables based on statistically significant probability levels. Results of the research and the methodology used for analysis purpose follow generally accepted trend of previous literature.

Based on the outcome of the research, it can be concluded that there is strong relationship between stock market development and economic growth in Azerbaijan with the time frame 1998-2016. Hence, for the benefit of the economy

Baku Stock Exchange needs to develop further road map for the expansion of market and attraction of foreign investors into the country through it. For this purpose, the ways of listing domestic companies in the stock and market needs to be widen for the bigger audience, which in the end will ease the access of domestically listed companies to foreign funds and lead to foreign currency inflow to the economy. Moreover, foundation and implementation of certain policies is mandatory for the purpose of guaranteeing security of the funds and stock market objects, which is essential for assuring foreign investors for making investment decisions. All the implementations consolidated will lead to growth of main economic indexes of Azerbaijan, expansions of industry and social welfare of people.

Compliance with Ethical Standards:

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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