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ARTÍCULO ORIGINAL

Effect of Stock Market Development on Economic Growth in Peru

Efecto del desarrollo del mercado de valores sobre el crecimiento económico en el Perú

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ABSTRACT

This paper aims to investigate the relationship, behavior, and relevance that the main variables of the Peruvian capital market have with the economic growth of Peru in the period 2015 - 2018, for which statistical series and the application of the methodology of a dynamic model have been used in order to validate the hypotheses and answer the problem posed. The results obtained, with each in monthly periods, showed that between Gross Domestic Product (GDP) and the variables of negotiable amounts and stock market capitalization there is a positive relationship during the period 2015 - 2018. However, these variables explain the variation of GDP in a smaller proportion.

Keywords: capital market; capitalization; economic growth.

RESUMEN

Este trabajo tiene como objetivo investigar la relación, comportamiento y relevancia que tienen las principales variables del mercado de capitales peruano con el crecimiento económico del Perú en el periodo 2015 – 2018, para lo cual se han utilizado series estadísticas y la aplicación de la metodología de un modelo dinámico que se han utilizado para validar las hipótesis y dar respuesta al problema planteado. Los resultados obtenidos, cada uno en períodos mensuales, mostraron que entre el Producto Interno Bruto (PIB) y las variables de montos negociables y capitalización bursátil existe una relación positiva durante el período 2015 – 2018. Sin embargo, estas variables explican la variación del PIB. en menor proporción.

Palabras clave: mercado de capitales; capitalización; crecimiento económico.

The stock market in a country is a key element for economic growth as it channels the resources directly from investors toward companies and governments, and this also provides liquidity to finance investment projects. Because of the importance of the stock market in the last two decades, emerging economies put greater emphasis into developing them. Such is the case that, at present, countries such as Brazil, Chile, Mexico, and Peru have an important share in the stock market globally because they have highly liquid and active stock exchange values; hence, it is believed that the growth figures of their Gross Domestic Product (GDP) in recent years are related to the development of their stock markets, since, as demonstrated in previous studies by Levine, R. & Zervos , S. (1998), Levine, R. (1997), and Levine, R. (1991), economic growth and the development of stock markets are positively related.

In recent years, the stock market has been developing but at very low levels in comparison to other markets in the region. One of the elements that do not allow the Peruvian stock market to take off is that it is highly sensitive to the stock market index in relation to the price of metals, given that the material sector has a greater representation in the stock market index leading to its collapse in 2015 (-33.43%) and 2018 (-3.12%) because of unfavorable downturns for our main acquisitor, the economic deceleration of China and the drop of 2018 of -3.12% before the trade war between the United States and China. Also, the BVL has limited and restrictive participation because of the size of legal emissions and structuring costs that emphasize small placements and lead to these being uncompetitive. Similarly, the taxation treatment does not facilitate the division of SMEs and minority investors in the BVL, which leads to less liquidity dynamism and market development of Peruvian stock. According to the foregoing, this research study tries to find out to what extent the GDP growth in recent years is explained by the development of the Lima Stock Exchange.

The methodology used in this research is a dynamic multiple linear regression model, which will allow us to measure the relationship and share of influence between the study variables and Peruvian GDP, referring to the studies of Ajibola, A. (2017), Omoke, J. M.

(2010), Contreras, M. B. (2010), and Zavaleta Vázquez, O. H., & Martinez Silva, I. D. (2015), who used the same study methodology. Furthermore, the Engle–Granger integration test will be carried out to determine the long-term relationship between the variables. This study includes the following sections: theoretical framework, methodology, results, discussion, and conclusions.

THEORETICAL FRAMEWORK

Model of economic growth with financial intermediation

According to Pagano, M. (1993), this model is developed with a constant saving rate and financial intermediation, which differs from the neoclassical model and the endogenic growth model in which AK technology has constant returns in capital. Consequently, without the need for technological progress as an exogenous variable, it generates long-term rates of product growth per capita in an economy.

Liquidated savings in the financial intermediation process $(1 - \theta)S$ is explained as resources assimilated by financial intermediaries in the form of benefits for services provided, as well as resources absorbed by inefficiencies of financial intermediaries. Therefore, the amount of savings channeled by the investment is equal to the savings generated minus the savings lost.

$$S - (1 - \theta)S = \theta S = I \tag{1}$$

Where:

θS: Amount of savings channeled to the investment.

When $\theta = 1$; saving is channeled completely to the investment

When $\theta < 1$; saving is channeled partially to the investment

By replacing equation (1) in the endogenous growth model, the following is obtained:

$$kt = \theta sA - (\delta + n)kt \tag{2}$$

To obtain the growth rate of $\dot{k_t}$ the equation (27) is divided by k_t

$$\frac{\dot{k_t}}{k_t} = \theta sA - (\delta + n) \tag{3}$$

Therefore, equation (3) shows that the savings channeled to investment θ affects the rate of long-term growth capital ($\dot{k_t}$). Likewise, it is observed that capital growth per capita is constant as marginal productivity is independent of capital stock. According to Levine, R. (1991), in report "Stock Markets, Growth, And Tax Policy," a model is proposed that demonstrates that the main incentives for the creation of stock markets in an economy is liquidity irrigation and the risk of productivity as these risks decrease well-being and discourage investment in companies. However, the investment made by investors in a large number of companies in markets values and diversification they make of productivity shocks, generates an increase in well-being, in the amount of resources invested, and in the growth rate of a steady economy. Thus, economic growth is affected by stock markets in two ways: due to the dependence on company efficiency by externalizing human capital production, stock

markets increase the efficiency of companies by eliminating the leakage of capital, which accelerates the growth rate of human capital and per capita production. The stock markets increase the amount of resources destined for companies by increasing liquidity and investment growth and, thus, the risk of productivity is reduced, boosting the growth of human capital and production.

Per capita growth in a non-stock market economy is linked to the accumulation of human capital; in other words, the faster the human capital accumulation rate, the faster the product growth per capita, where $0 < g_y < 1$ meaning growth can be negative or positive.

$$g_y = H\left[(1-\theta)\pi^{\theta}\right]q = Hpq = Hp\left[\frac{n(\lambda-1)}{(R-n)+\lambda(n-x)}\right] \quad (4)$$

$$q = \left[\frac{n(\lambda-1)}{(R-n)+\lambda(n-x)}\right] \quad (5)$$

$$\boldsymbol{g_y^s} = H\pi^{-\delta}pq^s = H\pi^{-\delta}p\frac{\varepsilon\pi}{1-\pi+\varepsilon\pi} \quad (6)$$

Where:
q^s: is the companies' resource.

H: is a constant.

π: is the average fraction of resources eliminated from companies in t + 1.

The growth rate of the stock market differs from the non-stock market in the way in in which the stock market increases the efficiency of companies. Even though investment decisions are equal, $q^s = q$ the growth of the stock market economy will be greater than the non-stock market as it will eliminate capital leakages. Thus, instead of liquidating capital, brokers who receive liquidity shocks sell their shares to brokers that value consumption in a t+3 period and, therefore, greater capital is preserved in companies during t+1 and t+2 periods. Moreover, another way it in which it differs is that it influences growth by increasing, in greater proportion, the amount of company resources $q^s > q$, that is, in a stock market, the investment of resources is greater for companies which generate greater growth in the stationary state. Further, the appearance of the stock market helps manage the risk of liquidity productivity at the same time as accelerating growth and attracting resources to companies, given the assumption that in this model the savings rates are fixed at 1, the stock markets only promote growth by increasing company productivity or refining the allocation of resources.

METHODOLOGY

This study has a descriptive statistical type methodology, in view of which the context and problem is described through a set of provided data and information. Further, a type of explanatory research is followed as it is sought to determine the cause and effect. Besides this, a quantitative type analysis is also carried out for the purpose of calculating the results in relation to the goals set and to validate the hypotheses raised.

Description of the Model

The analysis plan that follows the investigation is through the vector auto regression methodology (Var) according to Enders, W. (2010) and Wooldridge, J. (2013). This model is

suitable when using time series data to determine the causality ratio among the variables and their long-term relationship in the chosen study period. In general, the multiple linear regression model is represented in the following equation:

$$VAR(P): Y_t = A_0 + Y_{t-1} + A_{t-2}Y_{t-2} + A_{t-3}Y_{t-3} + \cdots + A_pY_{t-p} + e_t \quad (7)$$

Where the time series Y_t is modeled in terms of its own past Y_{t-p} with p = 0,1,2… and from a term of perturbation e_t.

The estimate of a VAR model was performed with a variable:

$$PBI_t = [MN_t, DCB_t, DIPC_t\ ]$$

Thus, the Tetravariate Var was proposed with 8 of the stationary series PBI_t, MN_t, CB_t, IPC_t, represented as follows:

$$\begin{aligned}
PBI_t &= \hat{a}_{10} + \hat{a}_{11}PBI_{t-1} + \cdots + \hat{a}_{14}PBI_{t-4} + \hat{a}_{11}MN_{t-1} + \cdots + \hat{a}_{14}MN_{t-4} \\
&\quad + \hat{a}_{11}IPC_{t-1} + .. + \hat{a}_{14}IPC_{t-4} + \hat{a}_{11}CB_{t-1} + \cdots + \hat{a}_{14}CB_{t-4} + e_t \\
MN_t &= \hat{a}_{20} + \hat{a}_{21}PBI_{t-1} + \cdots + \hat{a}_{24}PBI_{t-4} + \hat{a}_{21}MN_{t-1} + \cdots + \hat{a}_{24}MN_{t-4} \\
&\quad + \hat{a}_{21}IPC_{t-1} + .. + \hat{a}_{24}IPC_{t-4} + \hat{a}_{21}CB_{t-1} + \cdots + \hat{a}_{24}CB_{t-4} + e_t \\
\Delta IPC_t &= \hat{a}_{30} + \hat{a}_{31}PBI_{t-1} + \cdots + \hat{a}_{34}PBI_{t-4} + \hat{a}_{31}MN_{t-1} + \cdots + \hat{a}_{34}MN_{t-4} \\
&\quad + \hat{a}_{31}IPC_{t-1} + .. + \hat{a}_{34}IPC_{t-4} + \hat{a}_{31}CB_{t-1} + \cdots + \hat{a}_{34}CB_{t-4} + e_t \\
\Delta CB_t &= \hat{a}_{40} + \hat{a}_{41}PBI_{t-1} + \cdots + \hat{a}_{44}PBI_{t-4} + \hat{a}_{41}MN_{t-1} + \cdots + \hat{a}_{44}MN_{t-4} \\
&\quad + \hat{a}_{41}\Delta IPC_{t-1} + .. + \hat{a}_{44}\Delta IPC_{t-4} + \hat{a}_{41}\Delta CB_{t-1} + \cdots + \hat{a}_{44}\Delta CB_{t-4} + e_t
\end{aligned} \quad (8)$$

RESULTS

Once the VAR model was chosen, a test was made to verify if the model assumptions occur and for statistical reliability. It was verified that the variables were stationary; the variables cause GDP by Granger significance and can be predicted through its previous values, the model has a normal distribution and absence of autocorrelation. As the chosen model requires the time series to be stationary to predict behavior and avoid spurious regressions, it was also necessary for a causal relationship to exist between the explanatory variables toward the endogenous variable.

As a first step, the descriptive statisticians of the data were estimated to analyze their behaviors, which resulted in the variables not showing high deviations. Therefore, there is no problem of series variance. On the other hand, it is observed that the only variable that follows a normal distribution is stock capitalization (SC), as its p-value is greater than 0.05. Furthermore, the augmented DICKEY test (ADF) was applied to each variable to identify the existence of the unit root in the variables. The unit root test with interception was applied in view of the fact that the variables do not show a trend. The result that was obtained is that all the variables of the model are stationary without applying any difference.

Table 1. *Augmented Dickey–Fuller test*

Variable	P-value	Order of integration	Stationarity
GDP	0.0000	I(0)	Stationary
trade amount (TA)	0.0000	I(0)	Stationary
Consumer Price Index (CPI)	0.0000	I(0)	Stationary
SC	0.0000	I(0)	Stationary
Stock Index (SI)	0.0001	I(0)	Stationary

Note. This table shows the results of the DICKEY–FULLER unit root test. When the statistical test is less than the critical value, it is said that the variable has no unitary root, therefore, it is stationary in integration order p with a given level of significance. The number between parentheses is the integration order of the variables. 5% significance level. *Source.* Prepared by the authors.

As a final procedure in the data analysis, the Granger causal test is applied to each variable, and it was determined that variables cause the GDP by Granger significance. Prior to this, the optimal number of lags needed to be estimated according to the Akaike criteria. Consequently, all variables except the SI (IB) cause Granger significance to the GDP variable. Therefore, the stock exchange index was eliminated for subsequent estimation of the model.

Table 2. *Granger Causality Test*

Direction of causality	Causality relationship	Causality	p-value	Optimum lag	Lag according to
One directional	$TA_t \xrightarrow{Granger} GDP_t$	TA causes GDP	0.0187	11	AIC
One directional	$GDP_t \xrightarrow{Granger} TA_t$	GDP does not cause TA	0.2184	11	AIC
One directional	$CPI_t \xrightarrow{Granger} GDP_t$	CPI causes GDP	0.0146	10	AIC
One directional	$GDP_t \xrightarrow{Granger} CPI_t$	GDP causes CPI	0.0334	10	AIC
One directional	$SC_t \xrightarrow{Granger} GDP_t$	SC causes GDP	0.0011	12	AIC
One directional	$GDP_t \xrightarrow{Granger} SC_t$	GDP does not cause SC	0.6367	12	AIC

Note. In this table, the results of the Granger Causality test are shown. When the p-value is less than the level of significance, it is said that a variable is caused by Granger significance by another variable. 5% significance level. *Source.* Prepared by the authors.

The VAR model was estimated with optimal lags, it was found that the lag optimal model is of order 4 according to the Akaike criteria. After defining the optimal lags of the VAR model, the model was checked to see if it is correctly estimated by applying the T differences.

By applying the Granger causal test, it was found that three equations of the VAR model do not comply with the existence of causality between the series; therefore, the equation is not correctly specified. It was corrected by the introduction of dummy variables and, subsequently, two equations of the VAR model were caused by Granger significance by the other variables,

and it was concluded that these equations are correctly specified, that is, there is a causal relationship between the variables.

To verify the normality of the model, the Jarque–Bera normality test was performed, which gave as a result that the model did not follow a normal distribution because it shows a p-value from 0.0035 less than 0.05. Normality was corrected by the application of dummy variables. For this reason, the dummy D5 variable was introduced into the model. Therefore, the model shows a normal distribution.

Table 3. *Jarque–Bera Test*

Variable	Jarque-Beta	Df	P-Value
GDP	8.685497	2	0.0130
TA	0.346315	2	0.8410
CPI	0.057277	2	0.9718
SC	0.359761	2	0.8354
Articulation	**9.448850**	**8**	**0.3059**

Note. P - Approximate values do not take into account the estimation coefficient. This table shows the results of the Jarque–Bera test, when the probability is less than a level of significance of 5% then the variable has normality (P-Value> 0.05). Level of 5% significance. *Source.* Prepared by the authors.

The White test for heteroskedasticity was applied without carrying out the use of crossed terms, to check for the existence of heteroskedasticity in the VAR models, which showed a joint p-value of 0.6023. Therefore, the VAR model does not show heteroskedasticity variance.

Table 4. *White Test for Heteroskedasticity*

Joint test		
Chi – Squared	**Df**	**Prob.**
362.3300	370	0.6023

Note. This table shows the results of the White test for heteroskedasticity, when the probability is greater than a level of significance of 5%, thus, the model does not show heteroskedasticity variance (P-VALUE> 0.05) * Level of significance of 5%. *Source.* Prepared by the authors.

Then, the LM autocorrelation test was performed to the VAR model, and it was observed that the optimum lag 2 shows a p-value of 0.4201. Therefore, as the P-Value was greater than the level of significance of 0.05, the VAR model does not show autocorrelation.

Table 5. *LM Autocorrelation Test*

Lags	LM-Stat	Prob.
1	25.94420	0,0548
2	16.47890	0.4201
3	9.674889	0.8830
4	16.06561	0.4484
5	13.57778	0.6301

Note. This table shows the LM autocorrelation results, when the p-value is higher than the level of significance, it means that the model does not show autocorrelation. 5% significance level.
Source. Prepared by the authors.

Covariance matrix, where the residual variance of the returns, GDP_t, TA_t Chi_{tt} and SC_t are 0.001405, -0.002904, -2.00E-05 and -2.05E-05, respectively.

According to covariances, it can be seen that none have a high value of covariance. Therefore, it is concluded that there is no sign of a strong association between the variables.

Table 6. *Covariance Matrix*

	GDP	TA	CPI	SC
GDP	0.001405	-0.002904	-2.00E-05	-2.05E-05
TA	-0.002904	0.113278	-2.41E-05	0.000695
CPI	-2.00E-05	-2.41E-05	2.91E-06	-6.33E-06
SC	-2.05E-05	0.000695	-6.33E-06	0.000662

Source. Prepared by the authors.

As regards the correlation matrix, it is observed that the variable that shows greater correlation with GDP_t is the CPI_t with 31,2450% and negatively, with the variable TA_t it is GDP_t with 23,0130% and negatively. With respect to the CPI_t it is the GDP_t with 31,2450% and with SC_t the CPI_t with 14,4252% and negatively. Therefore, there are no correlations above 0.6, which indicates that a strong correlation is not determined between the residuals in the equations of the VAR model.

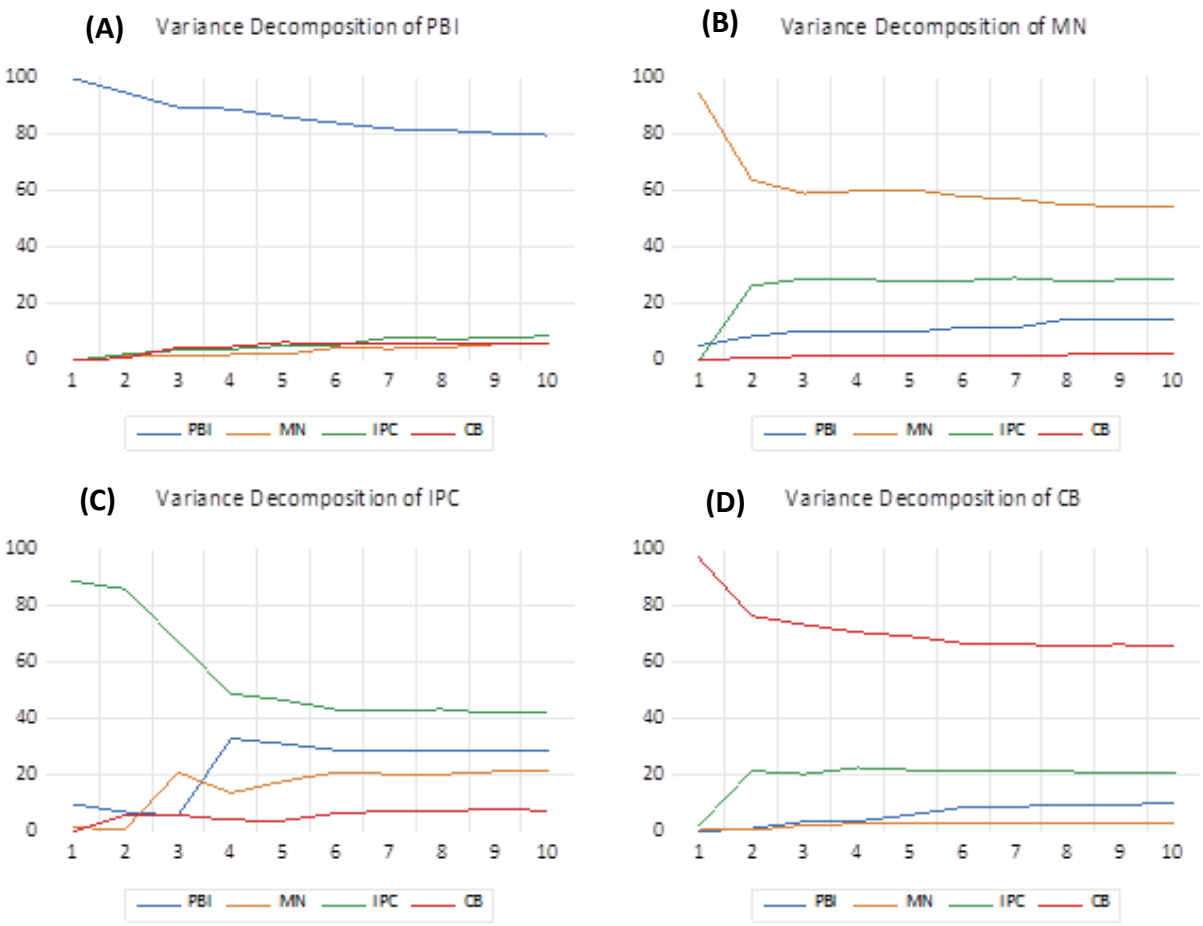
Table 7. *Correlation Matrix*

	GDP	TA	CPI	SC
GDP	1.000000	-0.230130	-0.312450	-0.021291
TA	-0.230130	1.000000	-0.042021	0.080260
CPI	-0.312450	-0.042021	1.000000	-0.144252
SC	-0.021291	0.080260	-0.144252	1.000000

Source. Prepared by the authors.

Next, the error variance was deconstructed to 10 periods, which helps the prediction error variance to be divided from the GDP variable into components that are attributed to different shocks that the variable may experience. This way it is possible to find out what percentage from the prediction error variance is because of shocks in the TA, CPI, and SC variables.

Figure 1. *Variance Decomposition*



Note. This figure shows the graphic representation of the variance decomposition of the endogenous variables of the VAR model. *Source:* Prepared by the authors.

- In Figure 1 (A), it is observed that the returning GDPt is explained by 10% by the other returning variables.
- In Figure 1 (B), it is observed that the returning TAt is explained by 30% by the other returning variables.
- In Figure 1 (C), it is observed that returning CPIt is explained by 30% by the other returning variables.
- In Figure 1 (D), it is observed that returning SCt is explained by 20% by the other returning variables.

Table 8 shows in detail the decomposition of the GDP variance, which in the first period of standard deviation (0.037487) is explained to 100% by its own variability. However, in period 2, it is observed that the standard deviation of 0.052521 is explained by a 2,008422% of tradable amounts, by a 2,210173% CPI and by 0.819141% SC. At the end of period 10, the influence of the CPI increased considerably reaching 8,659859%, while the other variables had an increase of up to 5,620242% in TA and 5,851215% SC. Therefore, it means that the TA, CPI, and SC variables are not the main resources to explain future changes in the GDP.

Table 8. *Decomposition of GDP Variance*

Periods	S.C	GDP	TA	CPI	SC
1	0.037487	100.0000	0.000000	0.000000	0.000000
2	0.052521	94.96226	2.008422	2.210173	0.819141
3	0.054168	89.80841	1.956914	3.652887	4.581786
4	0.054538	89.15869	2.004229	3.999229	4.837849
5	0.055580	86.38418	2.087639	5.189960	6.338219
6	0.057450	84.15839	4.474024	5.336873	6.030711
7	0.059775	82.12518	4.141438	8.094422	5.638962
8	0.061633	81.64343	4.543357	7.733544	6.079669
9	0.063192	80.61063	5.669543	7.814500	5.905323
10	0.063488	79.86868	5.620242	8.659859	5.851215

Note. The decomposition of each variable variance for 10 periods is specifically shown in this table. *Source.* Prepared by the authors

After carrying out the variance decomposition, the characteristic polynomial test was carried out in order to verify the stability of the model, thereby eliminating the risk of Spurity regression, and it was found that this model satisfied the status of stability.

Finally, the accumulated impulse-response function analysis was completed. As this function evaluates the dynamic behavior of the GDP variable before a positive shock of the TA and SC variables. 24 periods were chosen for the analysis of the accumulated impulse-response function, as it allows for the impact of GDP shock to be analyzed over time. In addition, it has the effect of softening the peaks of the differentiated variables to allow for a more feasible interpretation.

Firstly, the effect of a deviation of 1% of the TA variable was analyzed in period 1 on the GDP variable.

- As regards TA shocks in the same variable, it produces a decrease from Period 1 of 0.34 pp to 0.13 pp in period 4; this it is lessened until it becomes asymptotic in period 22.
- As regards GDP, the TA shock produces an increase in period 1 to period 7 of - 0.9 to 0.002 pp, then it registers a decrease until -0.010 in period 10 to eventually lesson into small variations.

Secondly, the effect of a shock (a 1% deviation) of the SC variable was analyzed in period 1 on the GDP variable.

- In relation to the reactions from a SC shock, it affects itself, it generates an increase in period 1 (0.026 pp) to period 15 (0.069 pp), later on it lessens to being asymptotic.
- With respect to GDP, it produces an increase in period 1 (-0.001 pp) to period 2 (0.005 pp), followed by this there is a recorded decrease until -0.006 pp in period 3 and then an increase up to 0.006 pp in period 7, a decrease to period 8 (-0-001) and it stays there for two further periods in order to finally only show positive variations and lessen from period 20.

Thirdly, the effect was analyzed of a shock (a 1% deviation) from the CPI variable in period 1 on the GDP variable, in which a behavior response was seen similar to that of the SC variable. Initially there was an increase in period 1 (-0.012 pp) to period 5 (0.007 pp) and then a drop was registered until period 8 (-0.009 pp), finally growing in period 10 (0-005 pp), decreasing in period 13 (-0.005 pp) and from then on lessening.

DISCUSSION

According to Granger's causation results, which allowed the variables to be determined in order to explain the GDP, it was determined that the stock market index variable does not cause GDP. There is empirical evidence of studies carried out, among them, studies by Contreras, M. B. (2010) and Lezama Palomino, J., Laverde Sarmiento, M., & Gómez Restrepo, C. (2017), who affirmed that the economic growth of a country is related to the stock market index, which represents the income yields of the main companies listed on the stock market. The arguments validating the opinion that SI does not cause GDP is that of Norges Bank Investment Management (2016) points out that the non-existence or weak empirical relationship between economic growth and the profitability of variable income is because of globalization, as the profit of several countries whose large companies are listed on the stock exchange and are multinationals comes from abroad.

Therefore, there are also great differences between countries because of the composition of the sector, as industries that tend to be more domestic are telecommunications and public services unlike material, financial, and industrial companies. This contrasts with the composition of the BVL index in which the sectors that predominate are material and finance related companies that are mostly made up from multinational companies.

Another argument is that only the stock market and highly competitive markets with a view to the future could provide for future changes in GDP growth. The low percentage value that represents the TA and SC variables toward the GDP that was estimated was because of the low development of market values that is seen in the size of emissions, low capitalization and competitiveness as well as low participation from national companies. This confirms what Levine, R. (1991) argues, when indicating that when the prices of shares are high compared to the cost of capital, companies are more likely to expand their activities and invest in new physical capital due to financing by issuing new shares. It is becoming known that countries with well-developed financial markets, shown by a high market capitalization, a large number of domestic companies, and initial public offers show a strong relation between share performance and economic growth.

CONCLUSIONS

In this research study, the impact of the representative variables of the stock market as trading amounts and SC on Peruvian GDP were examined. Through a VAR structure and its analysis tools, such as the accumulated response impulse function and the variance deconstruction, it was possible to analyze that the variables have a greater incidence on the subsequent fluctuations of GDP and the relative importance of these could be calculated.

Performing econometric analysis through self-recruitment vector methodology (Var), making use of time series of variables: The GDP, the SI, Tradable Amounts (TA), SC, and CPI. It was observed that the variables do not have any variance problem, as there are no high deviations. Furthermore, this was the results in the ADF stationary test that time series are stationary in zero order. Regarding Granger's causality test, the result was that all variables except for the SI caused Granger significance to the variable GDP. Therefore, the SI rating was eliminated for the subsequent model estimate.

The VAR model was estimated with the optimal lag of order 4 according to the Akaike (AIC) criterion. Regarding the three equations of the VAR model, they did not comply with the existence of causality between the series, which was corrected by the introduction of the dummy variables, for the correct equation specification and the non-omission of variables in the series. Moreover, a dummy variable was introduced for normal distribution correction.

According to the result obtained from the accumulated impulse-response function, it is shown that the response given by GDP because of its own innovations initially lowers its level followed by a fast ascent in period 5. On the other hand, because of a TA shock, there was a growth in period 7; further, because of a SC shock, there was a growth in period 2. It should be noted that GDP responses because of shocks from the TA and SC variables are small, statistically non-significant, and with less lasting effects.

About the results from the variance deconstruction, this shows the percentage of variability that each variable has on GDP. It was found that GDP is the most predominant variable because of its own variability such that in the first period, it is explained 100% by itself and from the second period, it is explained by 94.96% by itself, this is followed by trading amounts (TA) of 2% and SC of 0.82%. It is concluded that TA, CPI, and SC variables explain only a minor percentage, thus, they are not the main resources for explaining future GDP changes.

Finally, it is concluded that the development of the Lima Stock Exchange had a significantly positive impact on Peruvian GDP in the period from 2015 to 2018. However, the TA and SC variables are not the main ones explaining the changes in GDP as they have a minor significant influence. This is because the Peruvian economy has a small and limited stock market, which in recent years has shown little development.

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