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### The Influence of the Capital Market on Economic Growth in the USA

#### **Abstract**

*This article analyzes the impact of the capital market on economic growth in the US with the use of annual data. The study covers the years 1975-2019. As part of the analysis, the construction and estimation of an econometric model was made using the GRETLM program. The obtained results confirmed the statistically significant influence of the capital market on the economic growth in the USA.*

**JEL classification:** G10.

**Keywords:** capital market, economic growth, OLS, GARCH, GRETLM

**Paper type:** Theoretical research article

#### **Introduction**

The capital market is an effective source of raising capital. In return for providing financial instruments, the issuer receives funds that can be allocated to the further development of the company, and the buyer of securities can invest the remaining capital in an investment that may bring profits in the future. From the issuer's perspective, the above solution is beneficial as its offer is addressed to a wide group of potential investors. On the other hand, investors usually have extensive knowledge of the issuer and the market in which it operates. Thus, they are able to make a rational

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assessment of the planned investment, the expected rate of return and investment trends in a given sector.

The capital market is a market for medium and long-term financial instruments, which means that the period of return on investment is distant in time in relation to the moment of capital transfer and is not less than 1 year. This specification is conducive to mobilizing large capital in the said market, which has a real impact on the processes taking place in the economy.

The concept of economic growth includes, on the one hand, economic effects, quantitative relations in the process of increasing inputs and productivity, and on the other hand, the mechanism of economic growth, and even social relations that keep the entire system in a normal state. Thus, the second part of the growth process consists of the functional structure and the system of social interest, as well as the institutional structure of the economy. In addition, changes in production over time must also be taken into account.

This article explores the relationship between the capital market and economic growth. The development of capital markets and their impact on the economy is a topic of public discourse. In its context, extreme views arise and conflicting arguments are presented. On the one hand, it emphasizes the negative impact of financial development, which increases economic instability, and on the other hand, emphasizes its positive impact on productivity in the most efficient way of allocating capital. Therefore, it is an extremely important question, especially since the financial crisis of 2007-2011 managed to shake the good perception of the positive effects of the functioning of the capital market.

The aim of the article was to examine the degree of impact of capital market development on economic growth in the USA in the long term. The time horizon of the work covers the years 1975-2019. The research was based primarily on the results of a critical analysis of the literature on the subject. For this purpose, rich literature was used, as well as factual materials. The second stage was collecting the necessary statistical data and their selection. The third stage will include an econometric analysis based on the created econometric model, which will be subject to estimation.

## **1. The influence of the capital market on economic growth in the light of scientific research.**

From the perspective of theoretical analysis, there is a relationship between the capital market and economic growth, as shown by the results of research on the relationship between the financial market and economic growth (Didier T., Levine R., Montanes R. L., Schmikler S. L., 2020, p. 1-16). Several theoretical assumptions can be distinguished regarding the confirmation

of the potential correlation between capital markets and economic growth (Zhao R., 2019, p. 62-65). Based on the extended theory of Q-Tobin W. Brainard, the increase in the level of investment is influenced by favorable conditions on the stock market. The authors justify the chosen method with the causality caused by higher share prices (Brainard W., Tobin J., 1968). According to B. Malkiel, the overall impact of stock exchanges on economic growth is a product of the wealth effect (Malkiel B., 1999). This leads directly to an increase in the level of consumption. In the literature on the subject, there are also indications that there is a positive interaction between the functioning economy and stock exchanges by increasing the credibility of companies on capital markets, with a simultaneous increase in the price of individual shares of a given company (Beck T., Levine R., 2004, p. 423-442).

As part of the exploration of the problem, the authors constructed an econometric model, which was then estimated on the basis of selected research methods (Stulz R., 2004, p. 146-147). A common element of a large part of the published research article is the analysis of the relationships discussed by selected groups of countries, including, inter alia, factors such as:

1. Maturity of the capital market;
2. Level of economic development;
3. Participation in the international community;
4. The current financial system.

The version of the prognostic model proposed by R. Levin and R.G. Kinga is the basic econometric model for analyzing the relationship between the development of financial markets and the economic growth of a group of countries. This is the regression model for economic growth shown in Equation 1 (King R. G., Levine R., 1993, p. 717-737).

**Equation 1. Formula of economic growth regression model.**

$$Y_{it} = \alpha_0 + \alpha F_{it} + \beta X_{it} + u_{it}$$

Where:

1.  $Y_{it}$  is the real GDP growth rate per capita of i-th country in period t;
2.  $F_{it}$  is an indicator of the financial development of i-th country in period t (ratio of non-financial private sector loans to total domestic loans, ratio of current liabilities of the financial sector to GDP, ratio of domestic deposits to assets and total domestic assets of banks);
3.  $X_{it}$  represents a vector containing specific explanatory variables that are factors determining the economic growth of the i-th country in period t (relation of foreign trade turnover to GDP, relation of budget deficit to GDP, natural correlation of GDP per capita, government consumption to GDP).

The above model was estimated using the double least squares method. By replacing GDP per capita in the equation with other indicators, such as the rate of investment in GDP, the rate of capital per capita growth or the rate of increase in effectiveness per capita, it is possible to examine the impact of individual financial indicators development on the values of other variables. After analyzing a group of 80 countries with data from 1960-1989, the authors of the model use panel data to show that there is a relatively strong relationship between financial development and economic growth in individual countries (Caporale G. M., Howells P. G. A., Soliman A. M., 2005, p. 166-176).

The impact of capital markets on economic growth is not always positively correlated (Ang J. B., 2008, p. 39-40). In selected literature items it is indicated that the liquidity of buying and selling shares on capital markets may have a real impact on the weakening of corporate governance (Kozioł L., 2007, p. 216-220). This, in turn, may lead to a slowdown in economic growth (Peter L., Wachtel P., 2005). Despite ambiguous assessments of the impact of capital markets on economic growth, the vast majority of literature on the subject suggests a positive relationship between these factors (Ritter J., 2012, p. 8-18).

Over the years, different models of the impact of financial/ capital markets on the economies of different countries have been used (Jin D., Boubakari A., 2010, p. 14-20). Among the obtained results, a set of observed phenomena can be distinguished, which constitute the basis for the collective drawing of the following conclusions about the tested model:

1. Stock market capitalization has quite a strong positive and statistically significant impact on the growth of real GDP and real physical capital, indicating that firms need to make long-term investments in the real sector,
2. In the analyzed period, there was a statistically significant correlation between the development of financial markets and economic growth,
3. The relationship between total banks' assets and the exchange rate has a significant positive and statistically significant impact on the growth of real GDP.

## **2. Empirical analysis of the relationship between the capital market and economic growth.**

In studies on the impact of capital market development on economic growth in the US, data from the following databases was used:

1. World Bank;
2. Bureau of Economic Analysis.

For the needs of the empirical analysis, annual data from the period 1975-2019 were obtained. Data from previous years were not included due to the full availability of data obtained from 1975 for the purpose of econometric analysis. Data after 2019 were not analyzed due to the lack of published selected statistical data from recent years, which would have resulted in additional exclusion of other variables. It was decided to analyze the data presented in annual intervals due to the fact that the influence of the business cycle was not taken into account in this study.

The following statistical data was used:

1. GDP- Gross Domestic Product;
2. CAPINV- capital investments;
3. HOUCON- consumption of households;
4. EX- export of goods and services;
5. IM- import of goods and services;
6. FOREXRG- foreign exchange reserves, including gold;
7. GOV- government expenditure;
8. KAP- stock market capitalization;
9. NUMCOM- number of listed companies;
10. POP- number of population;
11. SAV- savings.

The obtained financial data was made uniform, adopting the US dollar as the unit of account. In addition, the deflator (2015) was applied to them in order to obtain real values, which is of key importance when analyzing data in a long time horizon. Moreover, the collected data for the purposes of calculations was transformed into a logarithmic form.

The basic econometric model for studying the relationship between financial development and economic growth is the version of R. Levin and R.G. King's regression model of economic growth by R. Barro (Filipowicz K., 2019, p. 18-35). The model will serve as a reference point for building your own model examining the relationship between the capital market and economic growth. The necessary calculations were made using the GRET program. The natural log of real GDP was used as the dependent variable.

As a result of the activities carried out, a model was constructed to study the impact of the capital market on economic growth in the USA.

**Equation 2. Author's econometric model examining the influence of the capital market on economic growth in the USA.**

$$\ln GDP_t = a_0 + a_1 \ln FOREXRG_t + a_2 \ln KAP_t + a_3 \ln NUMCOM_t + u_t$$

Where:

$\ln GDP_t$ - stands for the natural logarithm of the real Gross Domestic Product

InFOREXGt- is the natural logarithm of real foreign exchange reserves, including gold

InKAPt- is the natural logarithm of real stock market capitalization

InNUMCOMt- is the natural logarithm of the number of listed companies

A backward stepwise regression approach was used when building the model. The estimation of structural parameters by the method of least squares depends, among others, on from the favorable properties of the estimator obtained from CLRM (Gruszczyński M., Kuszewski T., Podgórska M., 2009, p. 17-19). Therefore, the OLS model was estimated, the results of which are presented in Table 1.

**Table 1. The results of the OLS model estimation.**

OLS, using observations 1975-2019 (T = 45)					
Dependent variable: I_GDP					
HAC standard errors, bandwidth 2 (Bartlett kernel)					
name	coefficient	std. error	t-ratio	p-value	significance level
const	2,08829	0,279711	7,466	3,65e-09	***
I_FOREXRG	0,298508	0,0421011	7,090	1,23e-08	***
I_KAP	0,515628	0,0292211	17,65	9,27e-021	***
I_NUMCOM	0,0818444	0,0357097	2,292	0,0271	**
Mean dependent var		8,540947	S.D. dependent var		1,083214
Sum squared resid		0,327532	S.E. of regression		0,089379
R-squared		0,993656	Adjusted R-squared		0,993192
F(3, 41)		4348,148	P-value(F)		2,42e-51
Log-likelihood		46,91146	Akaike criterion		-85,82293
Schwarz criterion		-78,59628	Hannan-Quinn		-83,12891
rho		0,228919	Durbin-Watson		1,535212
<p>White's test for heteroskedasticity -  Null hypothesis: heteroskedasticity not present  Test statistic: LM = 9.25258  with p-value = P(Chi-square(9) &gt; 9.25258) = 0.414293</p> <p>Test for normality of residual -  Null hypothesis: error is normally distributed  Test statistic: Chi-square(2) = 13.8596  with p-value = 0.000978186</p> <p>Test for ARCH of order 1 -  Null hypothesis: no ARCH effect is present  Test statistic: LM = 0.596625  with p-value = P(Chi-square(1) &gt; 0.596625) = 0.439869</p>					

\*\*\* - the variable is significant at the significance level of 0.01,

\*\* - the variable is significant at the significance level of 0.05,

\* - the variable is significant at the significance level of 0.1.

Source: Own study based on the GRETL program.

As it results from the tests performed, in this estimation there is heteroscedasticity and the ARCH effect occurs. While the p-value for the test for the normality of the distribution of residuals is below 0.01, the distribution of the empirical distribution indicates the existence of an abnormal distribution of the model residuals (the so-called long tail). Thus, with this estimation method, the model does not meet the classic regression assumptions. Attempts to estimate the model using the Cochran-Orcutt, Prais and GLS methods did not give positive results in the tests.

The obtained results confirm that in the models estimated from financial series, the random components may not correspond to the assumption of the normal distribution. Hence, the least squares estimation is incorrect. In most cases, the variance estimates are incorrect, resulting in low power in commonly used tests. Therefore, it is necessary to look for a different estimation method in the problem under study (Maciejewska J., 2008, p. 534-536).

The GARCH model is a model used to predict the variability of financial time series due to the fat-tail phenomenon or aggregation of variance in the rate of change distribution. This can be explained by the presence of outliers in the financial time series. One-off phenomena are particularly important because they constitute a significant single deviation from the predicted value of the studied phenomenon only in one period and do not affect the series values in subsequent periods (Domańska S. A., 2020, p. 122-128). The GARCH estimation results are presented in Table 2.

**Table 2. Model: GARCH estimation, observations used 1975-2019 (N = 45).  
Dependent variable (Y): lnRPKB. Standard errors of Quasi-Maximum Likelihood**

<b>GARCH, using observations 1975-2019 (T = 45)</b>					
<b>Dependent variable: I_GDP</b>					
<b>QML standard errors</b>					
<b>name</b>	<b>coefficient</b>	<b>std. error</b>	<b>z</b>	<b>p-value</b>	<b>significance level</b>
<b>const</b>	2,08829	0,272457	7,665	1,79e-014	***
<b>I_FOREXRG</b>	0,298508	0,0336228	8,878	6,80e-019	***
<b>I_KAP</b>	0,515628	0,0240852	21,41	1,11e-101	***
<b>I_NUMCOM</b>	0,0818444	0,0342567	2,389	0,0169	**
<b>alpha (0)</b>	0,00727850	0,00224054	3,249	0,0012	***
<b>Mean dependent var</b>	8,540947	<b>S.D. dependent var</b>	1,083214		
<b>Log-likelihood</b>	46,91146	<b>Akaike criterion</b>	-81,82293		
<b>Schwarz criterion</b>	-70,98295	<b>Hannan-Quinn</b>	-77,78189		
<b>Unconditional error variance = 0.0072785</b>					
<b>Test for normality of residual -</b>					
<b>Null hypothesis: error is normally distributed</b>					
<b>Test statistic: Chi-square(2) = 13.8596</b>					
<b>with p-value = 0.000978186</b>					

\*\*\* - the variable is significant at the significance level of 0.01,

\*\* - the variable is significant at the significance level of 0.05,

\* - the variable is significant at the significance level of 0.1.

Source: Own study based on the GRETL program.

The model parameters can be estimated using the maximum likelihood method. This method allows for asymptotically effective parameter estimates to be obtained if the assumptions about the normality of the distribution are met. The quasi-maximum likelihood (QML) method is the standard method for estimating GARCH models. Moreover, this approach produces consistent parameter estimates even if the distribution is not normal (Fiszeder P., 2009, p. 21-24). Contrary to the results of the tests of the normality of distributions carried out with the use of OLS during model estimation, in the case of GARCH models, the phenomenological feature of financial data analysis in the form of time series is the so-called "Fat tails".



The analysis of the content of Table 2 shows that all explanatory variables are statistically significant and that there is quite a significant positive impact of changes in stock market capitalization on the volatility of the economic growth rate. Moreover, a slight positive effect of changes in the number of listed companies on the volatility of the economic growth rate is noticeable. Thus, it can be assumed that the conditions for confirming the positive impact of the capital market on the economic growth of the USA are met.

### Conclusion

The empirical analysis confirms the dependence that the development of the capital market has a positive effect on economic growth in the USA. When interpreting the constructed model, it should be assumed that if the value of stock market capitalization increases by 1 percentage point, the value of GDP will increase by about 0.52 percentage point, assuming the stability of the other variables. If the number of listed companies increases by 1 percentage point, then the GDP value will increase by about 0.08 percentage point, assuming the stability of the other variables. In the event that the value of foreign exchange reserves (including gold) increases by 1 percentage point, then the value of GDP will increase by about 0.30 percentage point, assuming the stability of other variables.

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