European Journal of Sustainable Development (2022), **11**, 1, 124-134 ISSN: 2239-5938
Doi: 10.14207/ejsd.2022.v11n1p124

The Reasons for the Growth of the US Stock Market

By Illia Morhachov[1], Olga Chorna[1], Olshanskyi Oleksandr[1], Andrii Martynov[1], Ievgen Ovcharenko[1], Olena Khandii[1], Yevhen Ivchenko[1]

Abstract
Sustained economic growth as well as the reasons for this growth are fundamental and important issues in economic theory. The article considers the hypothesis regarding the influence of these two factors on the growth of the United States stock market: the country's gross domestic product as well as the money supply in various aggregators. The purpose of the work is to determine the reasons for the growth of the United States stock market. The following methods were used to determine the influence of the gross domestic product and the money supply on the corresponding stock market, namely, the correlation-regression and graphical analysis as well as the comparison of average annual growth rates. It has been discovered that in order to objectively find out the causal relationship between the factors, it is important to use such methods through the integrated approach. As a result, it has been observed that the fluctuations in the gross domestic product of the USA do not significantly affect those in the stock market of the country. On the contrary, the economic and mathematical models of the S & P-500 stock index and the money supply are similar. The corresponding similarity allowed the authors to substantiate the existence of a significant impact of the change in the money supply on the dynamics of its stock market. In turn, the reason for the growth of this index is a significant reduction in the key rate, which results in cheaper prices for credits.

Keywords: stock index S & P-500, gross domestic product, money supply, stock market

1. Introduction

Since 2010, the United States stock market has grown significantly. In particular, the average annual rate of such growth was 11.48%, if determined by the S & P-500 stock index. At first glance, there is nothing surprising about this: the figure of annual 11.48% growth is not too high. However, compared to other countries, this index points to the leadership of the United States stock market in terms of growth rates. For example, the German stock market over the past ten years has grown by an average of 8.07% per year, that of Japan by 8.57% (Note: the Japanese market has grown significantly in the latest 10 years, whereas the increase of only 2.38% per year has been observed for the past 36 years. That is, the Japanese stock market is an example of stagnation.), that of China by - 0.72%. Long-term growth of the stock market is uncommon even for developed countries as well as for the countries whose gross domestic product has been growing at a higher rate in recent decades. Examples can be given of other countries as well, but the result will be the same: the United States stock market is the leader in terms of growth. In such circumstances, it is important to specify the reasons for such growth.
In our study, two hypotheses have been induced:
1) the stock market in the USA has grown as a result of its gross domestic product

| [1]Volodymyr Dahl East Ukrainian National University, Ukraine

dynamics;
2) the United States stock market has increased resulting from the corresponding movement of the United States money supply (in dollars) in M1 and M2 aggregators.
Sustained economic growth as well as the reasons for this growth are fundamental and important issues in economic theory.
Since corporate profits are part of the country's gross domestic product, and the size and dynamics of profits affect the price of the stock, it is the dynamics and fluctuations of the country's gross domestic product that have been chosen as a factor that influences the country's stock market.
On the other hand, the growth of the money supply in the country increases the opportunities for buying securities as well as other assets. Therefore, growth of the money supply in the country has been chosen as the second factor affecting the country's stock market. The increase in the money stock results in inflationary processes and price rise for almost all goods. But inflation takes place in response to the unsecured money issued mainly to cover the budget deficit.
When considering this factor, it should be mentioned that securities, unlike other goods, are purchased not for consumption, but for increasing the capital. That is, if there is money, securities can be bought without using the concept of "sufficiency." At the same time, the investor compares the value of money in the financial market and the profitability of securities. When the value of money is significantly reduced (that is, the key rate is reduced) in the stock market, it is credit resources that are used to purchase securities, usually corporate shares. At the same time, such money is not issued to cover the budget deficit, therefore, the money supply grows at the expense of the increase in the volume of loans that are used for investments in the stock market. The initial step for retaliatory growth in the money supply is the reduction in the key rate by the Federal Reserve System. In addition, it was in 2020 that the United States of America further developed targeted financial support programs for leading corporations and financial institutions (including funds and banks) to address the impact of the COVID-19 crisis, in addition to a substantial reduction in the key rate. Basically, such financial support was reduced to buying corporate bonds at low rates, which allowed US business structures to have unlimited cheap credit resources. In particular, the investment company Berkshire Hathaway used this opportunity to increase the purchase of shares in leading corporations. Therefore, if China's business structures had a relatively cheap resource - labor, then the US business structures had the capital in the form of credit money.
That is why the growth of the money supply in the economy in various aggregators is considered to be a factor affecting fluctuations in the stock market. It is important to determine the quantitative influence of this factor.
The purpose of the work is to find out the reasons for the growth of the United States stock market.

2. Analysis of Recent Research and Publication

The analysis of recent studies and publications on the subject of the article [1-12] reveals an increased interest in the factors of sustainable growth of the country's economy. The works [1-8] considered close connection of economic growth issues of the countries with business cycles, that is, the cyclical nature of macroeconomic development. Most aspects of sustainable development of the country's economy lie precisely behind the problems of response cyclicality. In the above works, the gross domestic product of the country and its dynamics are considered as a criterion for the growth of the economy as well as for determining the corresponding cyclicality. It is also logical to consider the dynamics of the country's gross domestic product as a factor in the growth of its stock market.

In particular, [1-8] investigated the relationship between the financial market (crediting) and economic growth with its cyclical nature. In [4], the strengthening of the financial market was defined as a factor in the significant revolutionary economic development of the country's economy. It should be stated that these works [1-8] considered the financial market as a factor of influence on gross domestic product, if the latter is meant to be a criterion and indicator of economic development. In our study, on the contrary, we determine the factors of influence on the stock market, that is, the relationship is inverse. Considering theoretical foundations of our study, one is sure to touch on the scientific contribution of Milton Friedman. Its main positions are set out in [9]. His theories became especially popular in 2008-2009 in the context of the global financial and economic crisis which resulted in their practical application by the governments of the leading countries of the world. That is why, we consider the increase in the money supply in aggregators M1 and M2 as the main reason for the growth of the United States stock market.

3. Research Methods

Standard methods of economic-mathematical modeling, in particular correlation-regression and graphical analysis as well as calculation of indices of change in indicators are used as the main methods of research. The formulas of correlation coefficient and the least squares method are not given, since they were estimated using Excel standard capabilities. The average annual growth rate of the stock market was determined by stock indices (S & P-500, DAX, Nikkei 225, SSEC) according to the formula (CAGR):

$$\mathrm{CAGR} = \left(\left(\frac{V_N}{V_0}\right)^{\frac{1}{N}} - 1\right) \cdot 100\% \tag{1}$$

where N is a number of years;
V_N is the final value of the test indicator;
V_0 is the initial value of the test indicator.

$$N = N_k - N_0 \tag{2}$$

where N_k is the year corresponding to the final value of the test indicator;
N_0 is the year corresponding to the initial value of the test indicator.

CAGR shows an average annual growth rate in %. More details of using the determination method (CAGR) are given in [13].

A well-known S & P-500 stock index is used as the main benchmark for the growth of the United States stock market. This index includes more than 500 leading American companies with the highest level of capitalization. With the growth of shares of these companies, the S & P-500 stock index increases accordingly. Therefore, we do not take into account the value of bonds and the dynamics of their value.

4. Initial Data for the Study

Since the gross domestic product of the USA and the money supply in the US dollars in M1 and M2 aggregators are identified as the main reason for the growth of the United States stock market, the corresponding data are given in Table 1.

Table 1: Baseline data for the study

Year	The value of the S & P-500 in January	US gross domestic product, billion dollars	Money supply of M1 in January, billion dollars.	Money supply of M2 in January, billion dollars
1980	130	2857,33	383,7	1591,4
1981	133	3207,03	409,4	1600,1
1982	121	3343,80	442,7	1769,5
1983	147	3634,03	475,3	1943,2
1984	169	4037,65	525,3	2133,4
1985	177	4339,00	555,6	2322,9
1986	208	4579,63	620,1	2499,6
1987	259	4855,25	728,5	2745,2
1988	247	5236,43	753,2	2836
1989	284	5641,60	786,2	2993,8
1990	352	5963,13	798,3	3164,1
1991	336	6158,13	825,7	3280,1
1992	419	6520,33	909,3	3365,7
1993	438	6858,55	1027,8	3416,8
1994	474	7287,25	1128,4	3473,9
1995	465	7639,75	1154,4	3494,1
1996	617	8073,13	1130,5	3641,7
1997	776	8577,55	1081,7	3820,2
1998	975	9062,83	1080,9	4044,8
1999	1282	9630,70	1095,3	4384
2000	1401	10252,35	1138,6	4628
2001	1373	10581,83	1094,2	4947,5
2002	1130	10936,45	1193,6	5447,1
2003	855	11458,25	1215,7	5783,3
2004	1130	12213,73	1303	6071
2005	1182	13036,63	1353,7	6405
2006	1283	13814,60	1383,1	6713
2007	1443	14451,88	1355,7	7083,9
2008	1380	14712,83	1379,6	7525,5
2009	822	14448,93	1609,5	8283
2010	1070	14992,05	1665,4	8432
2011	1282	15542,60	1859,1	8809
2012	1308	16197,05	2198,1	9723,9
2013	1493	16784,83	2480,1	10454,5
2014	1776	17527,28	2694,1	11036,2
2015	2052	18238,30	2930,6	11714,3
2016	1930	18745,10	3079,7	12492,1

Year	The value of the S & P-500 in January	US gross domestic product, billion dollars	Money supply of M1 in January, billion dollars.	Money supply of M2 in January, billion dollars
2017	2275	19542,97	3388,8	13257,3
2018	2826	20611,88	3581,4	13864,9
2019	2595	21433,23	3717,4	14429,8
2020	3265	20807,27	3975,4	15337,7
2021	3802		6741,7	19560,4

Source: according to FRED® data service

5. Results

5.1 Modeling of the American stock index S & P-500

Graphical representation of the dynamics of the American stock index S & P-500 is given in Fig. 1.

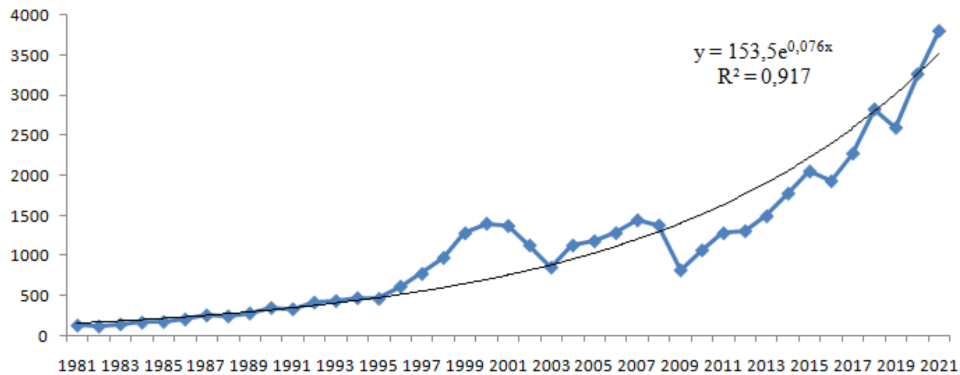

Fig 1. Dynamics of the American stock index S & P-500
Sources: according to table 1

According to the economic and mathematical model (Figure 1), the growth of the United States stock market is characterized by the following model:

$$Y = K \cdot e^{0,076 \cdot X} \qquad (3)$$

where Y is the value of S & P-500 stock index corresponding to the period X;
K is a constant. In our model, its value is 153.5. To determine the growth rate of the test indicator, the value of this constant is not important;
X is the ordinal number of the year.
In the economic and mathematical modeling of the dynamics of the S & P-500 stock index, it should also be borne in mind that over the last 40 years (1981-2021) the average annual growth of the index under study accelerated compared to the previous ones (1941-1981) (Figure 2). Consequently, the stock market grows at a higher rate. In the period 1941-1981, the average annual growth of the S & P-500 stock index amounted to 6.68%, in the period 1981-2021 - 8.74%, and in the last decade - 11.48%.

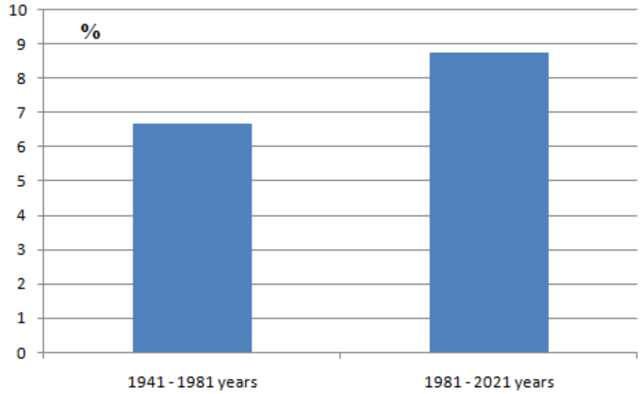

Fig. 2. Average annual growth rate of the S & P-500 stock index over periods of 40 years
Sources: according to table 1

5.2 Study of the impact of the United States gross domestic product on the S & P-500 stock index

With the use of the correlation coefficient for the test indicators, the value of 0.9366 for the period 1980-2020 has been obtained. At first glance there is a relationship. However, in this case, we put in doubt the available undeniable relationship of the test indicators based only on the correlation coefficient value. Since both indicators had steady growth, the correlation coefficient value could show the relation even if the indicators were not related. On the other hand, there should be a certain relationship between the gross domestic product and the stock index, and this is an unconditional statement. But we are trying to determine fluctuations in the stock market depending on the changes in gross domestic product. Therefore, graphical analysis is more suitable for fixing such variations. In particular, Fig.3. shows the dynamics of the gross domestic product of the United States of America.

According to Fig. 3, the corresponding dynamics is more straightforward than exponential. Comparison of Fig.1. and Fig. 3. does not allow to detect the coincidence of fluctuations in time.

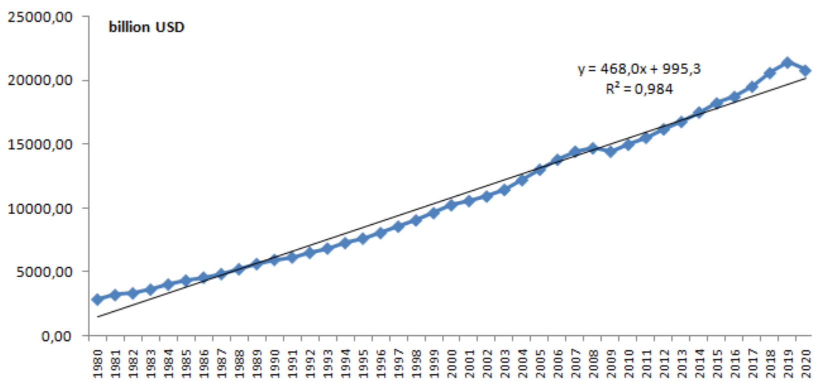

Fig. 3. The dynamics in the gross domestic product of the United States of America
Sources: according to table 1

The dynamic changes in the indices of test indicators are shown in Fig. 4.
Fig. 4 shows that the fluctuation level in the S & P-500 stock index is significantly higher than that in the gross domestic product of the United States. As a rule, both the gross domestic product and the stock market decline in recession years, but at different rates. Besides, the significant growth of the stock index cannot be explained by the corresponding growth of the gross domestic product.

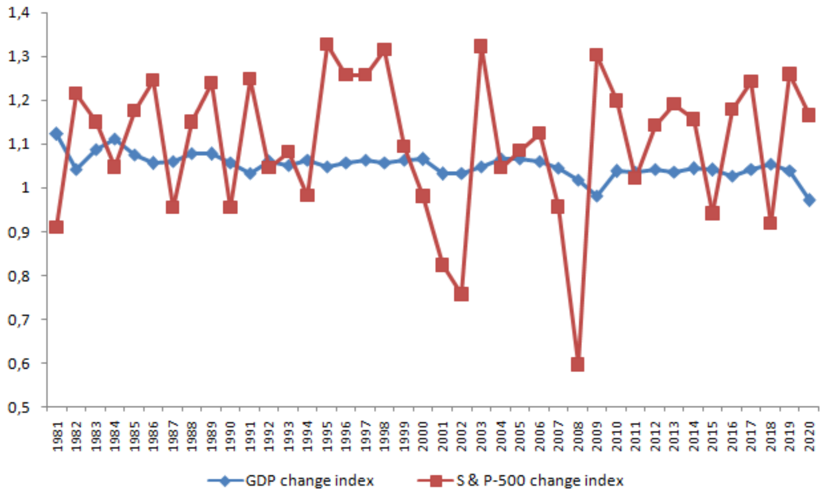

Fig. 4. Annual dynamic changes in the indices of test indicators
Sources: according to table 1

It is possible that the relationship regularity is manifested at longer time intervals. According to the formula (1) we determine the average annual growth rate in intervals of 5 years (Table 2).

Table 2: Average annual growth rate in intervals of five years,%

Period	1980 - 1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
GDP	8,71	6,57	5,08	6,06	4,92	2,83	4	2,67
S&P 500	6,37	14,74	5,73	24,68	-3,34	-1,97	13,91	9,73

Sources: according to table 1

Graphic image of Table 2 data is given in Fig. 5.
Table 2 and Figure 5 show a steady downward trend in the gross domestic product of the USA, while the growth rate of the stock index is stochastic. Five-year intervals do not manifest fluctuations in the growth of the gross domestic product of the United States of America, but there are fluctuations in S & P-500. In such time intervals, the hypothesis regarding the effect of gross domestic product on the stock index is not confirmed.

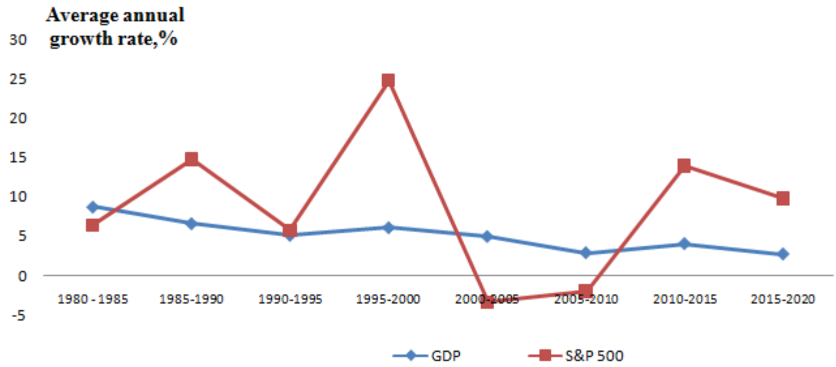

Fig. 5. Dynamics of average annual growth rate of the test indicators in 5-year intervals
Sources: according to table 2

We can increase the time intervals to 10 years (Table 3).

Table 3: Average annual growth rate at intervals of ten years, %

Періоʌ	1980 - 1990	1990-2000	2000-2010	2010-2020
GDP	7,63	5,57	3,87	3,33
S&P 500	10,47	14,81	-2,66	11,80

Sources: according to table 1

Graphical image of Table 3 data is shown in Figure 6.

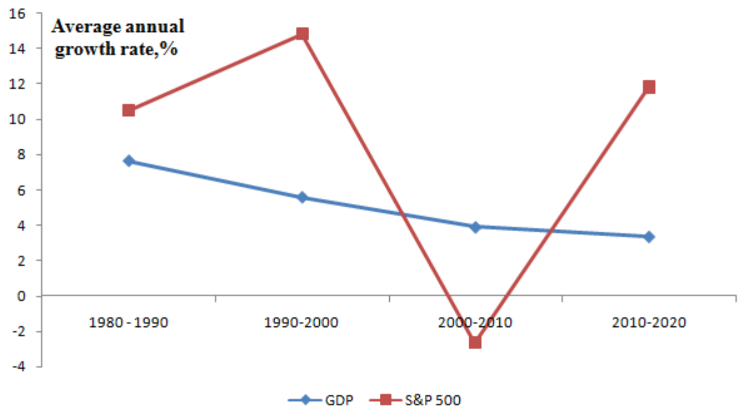

Fig. 6. Dynamics of the average annual growth rate of the test indicators in 10-year intervals
Sources: according to table 3

Besides, in 10-year intervals, it is impossible to identify the similar nature of the growth rates of the test indicators.
Since the impact of the gross domestic product of the United States of America on the S & P-500 stock index cannot be denied, it should still be recognized that fluctuations in such a factor (gross domestic product) do not result in significant fluctuations in the stock market.

5.3 Study of the influence of the money supply (in M1 and M2 aggregators) on the S & P-500 stock index

Graphical representation of the economic and mathematical model of the money supply in the US dollars in the M1 aggregator is given in Fig.7. which demonstrates the exponential nature of the test indicator.

The corresponding mathematical model is as follows:

$$Y = K \cdot e^{0,053 \cdot X} \quad (4)$$

where Y is the value of the money supply in the US dollars in aggregator M1, which corresponds to the time period X;

K is a constant. In our model, its value is 402.6. To determine the growth rate of the test indicator, the value of this constant is not of great importance;

X is the ordinal number of the year.

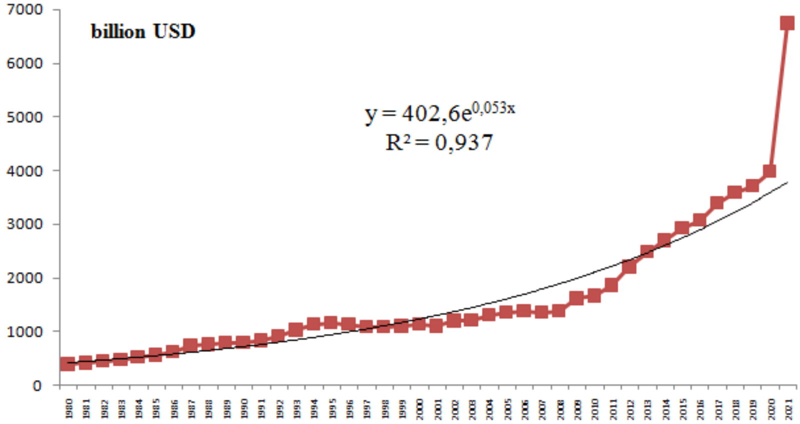

Fig. 7. Money supply dynamics in the US dollars in M1 aggregator
Sources: according to table 1

Graphical representation of the economic and mathematical model of the money supply in the US dollars in the M2 aggregator is given in Fig. 8.

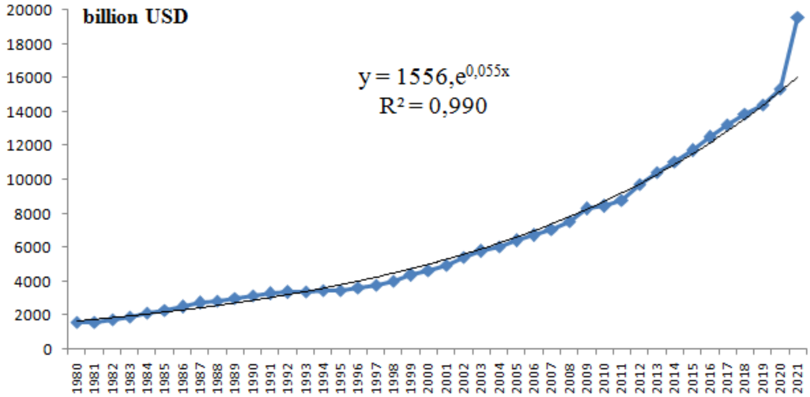

Fig. 8. Dynamics of the money supply in the US dollars in M2 aggregator
Sources: according to table 1

Figure 8 reveals the exponential nature of the test indicator.
The corresponding mathematical model is as follows:

$$Y = K \cdot e^{0{,}055 \cdot X} \quad (4)$$

where Y is the value of the money supply in the US dollars in M2 aggregator, which corresponds to the time period X;
K is a constant. In our model, its value is 1556. To determine the growth rate of the test indicator, the value of this constant is not important;
X is the ordinal number of the year.
Comparing the economic and mathematical models of the S & P-500 stock index and the money supply in M1 and M2 aggregators, some similarities should be noted, which gives reason to distinguish these factors as influential on the stock market. If the correlation coefficient is applied to the test indicators, their values will be as follows: 0.937 (S & P-500 related to M1) and 0.953 (S & P-500 related to M2). According to the values of the correlation coefficients, money supply in M2 aggregator is connected more closely with the known stock index.
It should also be noted that the coefficient at "X" in the S & P-500 stock index model exceeds the corresponding coefficients in the M1 and M2 models, which indicates a higher rate of growth of the stock market compared to the money supply. This excess can be explained either by the influence of other additional factors, or by the multiplicative action of M1 and M2 aggregators.
A specific nature of the United States stock market is characterized by the dominance of financial and credit institutions (banks and funds), which simultaneously have access to cheap credit resources as well as to the issue of their own bonds. These institutions are active players in the stock market (buyers of shares). If in March 2020 the key rate in the country fell to almost "0," then such institutions certainly took advantage of this opportunity. In addition, in practice, brokerage institutions can also give loans to their clients (both to large financial institutions and individual investors) in the amount of 25% of the value of shares which are credited to a broker's account on the security of such shares. It is this possibility that creates the effect of the multiplier.

6. Conclusion

Based on the results of economic and mathematical modeling, it was determined that fluctuations in the gross domestic product of the United States of America do not significantly affect the fluctuations in the country's stock market. The study of the impact of gross domestic product on the stock market showed that it is more appropriate to use the regression analysis rather than the correlation one as well as to compare the average annual growth rate according to the formula (1).
Comparison of economic and mathematical models of the S & P-500 stock index as well as the money supply in aggregators M1 and M2 allowed to confirm the hypothesis regarding the impact of the change in the volume of money in the economy on the country's stock market. Faster growth rates of the stock market compared to the increase in the money supply have been observed. An important reason for the growth of the money supply in the United States economy has been accounted for by a significant reduction of the key rate by the Federal Reserve System, which contributed to increasing crediting.

References

Stolbov M.I. (2008). Impact of the financial market on economic growth and business cycles. Economy of the XXI century. № 8, 55-69.

Ramey G. & Ramey V. (1994). Cross-country Evidence on the Link between Volatility and Growth. NBER Working Paper № 4959.

Shumpeter I. A. (1983). Theory of economic development. Progress, 169 - 170.

Hiks D. (2006). Theory of economic history. Economic issues, 76.

Minsky H. P. (1992). The Financial Instability Hypothesis. The Jerome Levy Institute of Bard College, Working Paper № 74, 1-10.

Levine R. (2004). Finance and Growth: Theory and Evidence. NBER Working Paper № 10766, 98.

Rozanova N., Nazarenko A. (2007). Impact of the stock market on economic dynamics in the overlapping generations model. Economic issues. № 3, 67.

Aghion P., Bacchetta P. & Banerjee A. (2004). Financial Development and the Instability of Open Economy. NBER Working Paper № 10246.

Yugai T.A. (2012). The thorny path of monetarism: to the centenary of Milton Friedman. Economy. № 3, 102 – 108.

Semenenko I., Halhash R. & Sieriebriak K. (2019). Sustainable development of regions in Ukraine: before and after the beginning of the conflict. Equilibrium. Quarterly Journal of Economics and Economic Policy. Vol. 14, Issue 2, 317–339. DOI: https://doi.org/10.24136/eq.2019.015

Halhash R., Semenenko I., Ovcharenko I. & Borova G. (2020). Innovative forms of realization of regional social policy by organizing public dialogue and communication in conditions of post-conflict transformation in Eastern Ukraine. European Journal of Sustainable Development. Vol. 9, No 2, 391–404. DOI: https://doi.org/10.14207/ejsd.2020.v9n2p391.

Klius, Y., & Chizh, V. (2017). Strategic Analysis of the Effective Development of Industrial Enterprises on the Basis of the Use of "Corporate Innovation Management Chart". Baltic Journal of Economic Studies, 3(5), 281-288. https://doi.org/10.30525/2256-0742/2017-3-5-281-288.

Morhachov I. & Ovcharenko Ie. (2020). Prerequisites for Successful Regulation of Regional Investment Processes. Management Theory and Studies for Rural Business and Infrastructure Development. Vol. 42. No. 3, 289-294. - https://doi.org/10.15544/mts.2020.28.