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Research Article

The Role of Digital Technologies in Capital Market Development: A Pathway to Economic Growth in Developing Countries

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Abstract: Digital technologies are important in developing capital markets in modern economic realities. Capital markets also have an essential role and weight in financial systems and can stimulate economic growth, investment, and savings in the country. Therefore, this research aimed to evaluate the causal relationship between market capitalization and economic growth in 27 developing countries, focusing on the role of regional integration and digitalisation. The hypothesis is that developing countries should focus on improving capital markets through regional integration and digitalization to stimulate economic growth. Quantitative data was used and based on the research results policy recommendations were developed. The research adopted a mixed method, including statistical and econometric analysis. The statistical analysis was carried out using graphical representations, deduction, and logical assumptions, while the econometric analysis was based on a panel data regression framework. The results showed that the weak development of the capital market due to poor digitalization in developing countries with small open economies had a significant negative effect on the investment environment and economic growth. Furthermore, a 10% increase in market capitalisation leads to a 1.8% and 0.21% increase in GDP and a 0.21% increase in GDP and FDI inflow, respectively. Recommendations on a complex institutional reform of the sector have been developed to eliminate possible obstacles to financial integration in the following directions, including institutional, legislative, and technical issues related to digital technologies. Implementation of public-private partnerships was also recommended as the best solution for overcoming financial barriers implementing digital technologies and developing capital markets in resource-constrained countries.

Keywords: Capital market; Developing countries; Digitalisation; Economic growth

1. Introduction

Globalisation and digitalisation of financial markets are the most critical trends in global economic development in recent decades (Batten et al., 2023; Na and Kim, 2022; Behera, 2021). Capital markets also have an essential role and weight in modern financial systems. Stock markets stimulate economic growth, investment, and savings in the country (Nneka et al., 2022; Samargandi et al., 2020). According to academic literature, an increase in stock prices leads to a simultaneous

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increase in individual portfolios, resulting in more consumption or savings (Degiannakis, 2022; Pradhan et al., 2019). The integration of capital markets enables companies to access more funding and sometimes competitive capital markets, thereby increasing economic development in the country. However, there is a need to have a high level of digitalisation in the integration of capital markets to avoid technical issues (Shkarupeta et al., 2024; Babkin et al. 2022; Grishunin et al. 2022).

Research on the relationship between capital market development and economic growth has gained the attention of economists for the past decades (Thaddeus et al., 2022; Yemelyanova, 2021; Nathaniel et al., 2020). There is no common opinion about the issue under discussion as the academic literature provides ambiguous results on the causal relationship under review. Some research showed no significant relationship between the stock market and economic growth (Nathaniel et al., 2020; Gulay, 2019), while others found a negative (Setiawan et al., 2021; Kapaya, 2020) or a positive influence (Bhattarai et al., 2021; Grbić, 2021).

The academic literature on the relationship between capital markets and economic growth can be divided into three categories. The first category includes research that provides evidence about the positive effect of capital markets on economic growth, through several major factors, namely market capitalization and capital mobility, as well as foreign direct and portfolio investments (Ji, 2010). Based on the analyses of relevant data from 1989Q1 to 2012Q4 and using the Global Vector Autoregressive (GVAR) framework, Samargandi et al. (2020) concluded that there was a strong positive influence of equity market and market capitalization on economic growth in BRICS economies. Similarly, Mcgowan (2008) suggested that a well-developed capital market facilitates allocation to an economy for growth and development, as well as provides successful entrepreneurs with the financing needed for corporate development. Guesmi et al. (2014) also research the regional integration of the Indonesian capital market and concluded that the differentiation of market assets (diversification) provides significant profits. The development of capital market integration also expands the choice of investors and companies in need of financing, thereby leading to higher economic growth while reducing dependence on bank loans (CMUR, 2015).

The capital market plays an important role in providing liquidity to investors (Debata, 2021), enabling easy and fast buying and selling of securities, thereby promoting market investment. The ability to trade securities facilitates the flow of funds between investors and businesses, enabling companies to raise capital quickly and efficiently. The capital market also promotes corporate governance and transparency (Ye et al., 2022). Listed companies are required to follow strict reporting requirements and publish financial results regularly. This promotes accountability and transparency, which is important to maintain investor confidence and attract new investment. By promoting better corporate governance, the capital market also helps reduce the risk of financial scandals and corporate failures.

The development of the capital market can lead to better economic competitiveness in individual economies through the promotion of innovation and entrepreneurship (Bae et al., 2021). Companies issue equity capital, which provides the necessary funds to invest in research and development. This can lead to the development of new products, technologies, and services, stimulating economic growth. Another way capital markets can stimulate economic growth is through international trade and investment (Silva et al., 2023; Bermejo et al., 2020). Companies receive funding from investors in other countries, thereby stimulating international trade and investment, as well as accelerating economic activity and growth.

Financial integration also has a significant influence on financial stability, by contributing to the ability to absorb shocks and promote development. However, in a world endowed with high capital mobility, close financial ties can increase the risk of cross-border financial "contagion" (Ulyah et al., 2023; Yu et al., 2012).

Based on panel data analysis of 36 countries in Africa from 1980 to 2010, Ngare et al. (2014) reported that stock market development had a strong positive influence on economic growth, particularly in small developing countries. Moreover, the stock market development leads to faster economic growth in countries with lower corruption levels.

The literature review shows that the capital market is important to economic growth and development. This provides a platform for businesses and individuals to access financing, and promote corporate governance and transparency, as well as international trade and investment. By providing businesses with the needed capital to expand and innovate, the capital market helps spur economic growth and improve the standard of living for individuals and societies worldwide.

The second category of academic literature on the topic under discussion argued that capital markets negatively influence economic growth (Setiawan et al., 2021; Kapaya, 2020; Asteriou and Spanos, 2019). Meanwhile, the third category showed no significant influence between these two macroeconomic concepts (Nathaniel et al. 2020; Gulay, 2019; Pan and Mishra, 2018).

Pan and Mishra (2018) studied the relationship between economic growth and the stock market in China using an Autoregressive distributed lag (ARDL) model to investigate. The results showed no evidence of the influence of stock market development on the real economy in the short run. Asteriou and Spanos (2019) also examined the influence of financial development on the economic activity in the European Union from 1990 to 2016 and concluded that after the global financial crisis of 2008, financial development hindered economic activity.

The integration of financial markets is an active topic of debate, especially in developing and transition economies. Despite the positive effects, capital markets remain underdeveloped, usually due to structural constraints. Limited revenues and the small size of the private sector can lead to a shortage of investors and issuers. However, capital market governance includes huge initial and operational costs for both regulators and participants. This is possible for countries with limited capacity and small markets. Relevant authorities are needed to create and manage regulatory legal frameworks and trading platforms. Similarly, issuers need to go through certain stages for listing and conduct more thorough and transparent financial reporting afterward. Empirical research by Eichengrin and Luengnarumitchai (2004) showed that there was a minimum efficient size of the stock market because larger trading volumes and issuance were more profitable.

Integrated capital markets will allow for the spread of savings across the region, cost and information sharing among market participants, and risk differentiation. Furthermore, there will be enhanced competition and innovation, expanded choice of financial products offered to regional and foreign investors, and deepened integration into the global economy due to an increase in the attractiveness of markets (MFW4A, 2007; Irving, 2005). The role of digital technologies and regional integration as a primary driver of capital market development has not been thoroughly explored. Therefore, this research attempted to bridge this gap by focusing on developing countries.

The current research aimed to evaluate the causal relationship between market capitalization and economic growth in 27 developing countries focusing on the role of regional integration and digitalisation. The hypothesis is that developing countries should focus on developing capital markets through regional integration and digitalization to stimulate economic growth. Based on the research results, policy recommendations were developed.

2. Methods

The research adopted a mixed method by analysing quantitative data using statistical and econometric analysis. The statistical analysis was carried out using the methods of graphical analysis, deduction, and logical assumptions. The secondary data was collected from the World Bank database.

There is strong academic evidence that the panel data framework is the most suitable method to estimate the relationship between economic indicators through time in a regional perspective (Jandhana and Agustini, 2024; Ngare et al., 2014). This method has been used by research to obtain robust results that will hold true for more than one country in a given period (Fuente-Mella et al. 2021; Musa et al., 2021). The panel data method is also commonly used for estimating the determinants of economic growth. Dewan and Hussein (2001) examined the determinants of economic growth using the panel data on 41 middle-income economies. The authors built random and fixed effects panel data models to estimate the coefficients. Tiwari and Mutascu (2011) also

examined the influence of foreign direct investments (FDI) on economic growth in 23 Asian countries from 1986 to 2008 using the panel data method and the random effects model. Olamide et al. (2022) investigated the effect of exchange rate and inflation on economic growth in SADC countries based on the dynamic panel method. Furthermore, Zardoub and Sboui (2020) used the panel data method to examine the relationship between economic growth, FDI, and remittances.

This research developed two-panel regression models to identify the effect of market capitalization on economic growth and foreign direct investments (the FDI to GDP ratio was used) from 2011 to 2019. The crisis year 2020 was not considered to obtain a more accurate average picture. The sample includes data on market capitalization, GDP, and FDI from 27 developing countries, including Argentina, Bangladesh, Bermudas, China, Colombia, Costa Rica, Cote d'Ivoire, Egypt, India, Indonesia, Iran, Jordan, Kazakhstan, Lebanon, Malaysia, Mauritius, Mexico, Morocco, Nigeria, Peru, Philippines, Russia, Sri Lanka, Thailand, Tunisia, Turkey, Vietnam. The countries were selected based on the level of economic development (criteria: developing country), market capitalization (criteria: from very low to very high), and data availability (criteria: no missing data). Data were subjected to primary statistical processing using the first differences method to ensure that all time series were stationary, which was confirmed using unit root tests. The econometric analysis was conducted using the Eviews 10 econometric package and the regression model (1) is as follows:

$$GDP_{it} = C + \alpha MC_{it} + u_i + \varepsilon_{it}$$

where i = 1, …, N represents the countries included in the model,

t = 1, …, T represents the periods used for the analysis,

MC_{it} represents a vector of time-varying explanatory variables of market capitalization in the selected 27 developing countries

GDP_{it} is the model's dependent variable

ε is the model's error term.

Considering that the data sample has all available years, the models' panels were balanced, with 243 observations.

The regression model (2) is as follows:

$$FDI_{it} = C + \alpha MC_{it} + u_i + \varepsilon_{it}$$

where i = 1, …, N represents the countries included in the model,

t = 1, …, T represents periods used for the analysis,

MC_{it} represents a vector of time-varying explanatory variables of market capitalization in the selected 27 developing countries,

FDI_{it} is the model's dependent variable,

ε is the model's error term.

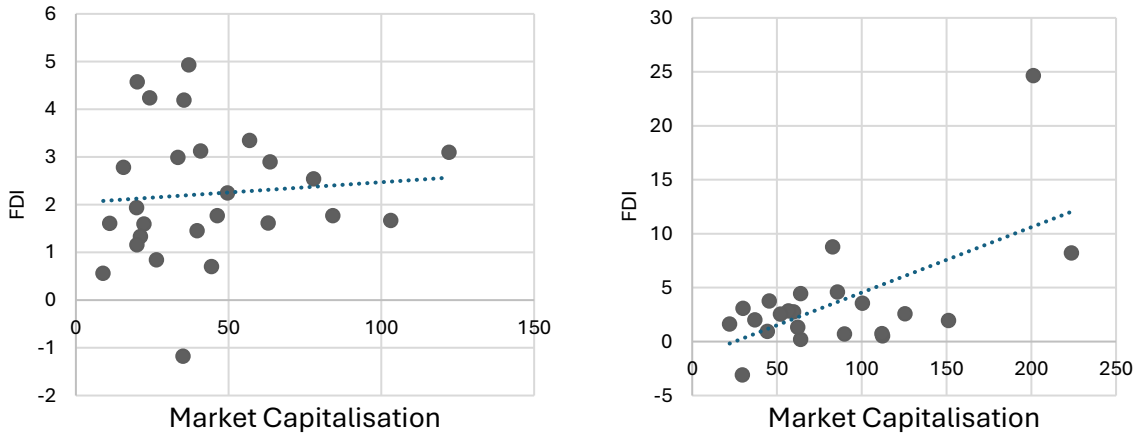
Figure 1 Time series analysis process

3. Results and Discussion

3.1. Statistical analysis

In recent times, there is a fierce competition between countries to attract FDI. However, the statistical analysis shows that the majority of FDI (35-40%) continues to be directed to the US and EU member states. Based on this point of view, financial markets contribute to economic growth

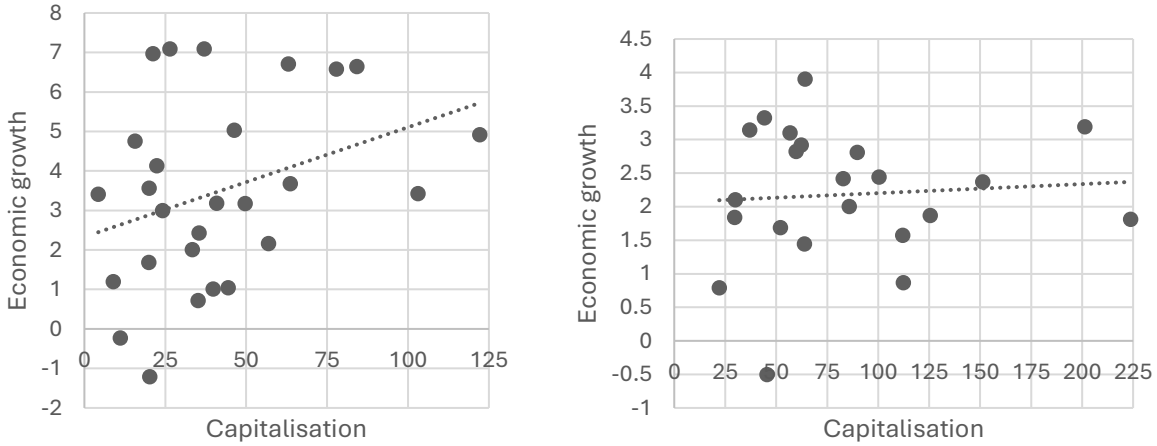
through the capital market, which facilitates the development of long-term investments, helps to reduce risk, and provides liquidity for organizations. The capital market is important for economic growth by attracting funds for new investments. The more developed the capital market, the higher the flow of FDI to a given country. The trend of the positive influence of market capitalization on investment attraction in selected developing countries is evident through the scatter graph shown in Figure 2. Meanwhile, this relationship is much more robust in developed countries.



a. Developing countries b. Developed countries

Figure 2 The effect of market capitalization on foreign direct investment in 1a. Selected developing countries and 1b. selected developed countries over five years, 2015-2019 average

The statistical analysis shows that the development and deepening of the capital market increase market capitalisation, as well as have a positive influence on investments and economic growth in selected developing countries. Malaysia, Thailand, India, Philippines, and China, with the highest market capitalization, had the highest and most stable average economic growth rates during the last five pre-crisis years. Figure 3 shows the trend of the positive influence of market capitalization on economic growth in the selected developing countries. Meanwhile, this effect is much weaker in developed countries, which are characterised by relatively lower economic growth rates characterize developed countries.



a. Developing countries b. Developed countries

Figure 3 The effect of market capitalization on economic growth in (a) selected developing countries and (b) selected developed countries over five years, 2015-2019 average

In summary, the statistical analysis showed that market capitalization had a positive effect on economic growth directly and through attracting foreign direct investments. However, to get more valid grounds for hypothesis testing the next stage of the current research consists of an econometric analysis based on panel data.

3.2. The role of the capital market in economic growth. Panel data analysis

A panel regression analysis was carried out to identify the effect of market capitalization on economic growth in developing countries. The sample includes data from 27 developing countries from 2011 to 2019, as shown in section 2.

There are three possible submodels for estimating the coefficients of the panel data model presented in section 2, depending on the nature of the individual residual, namely Pooled-OLS, Fixed, and Random effect. Considering the results of the performed tests, the Random effects sub-model was selected for estimating the coefficients, as shown in Table 1.

Table 1 Model (1) panel data regression results

Variable	Coeff.	t stat.	p-value
MC	0.018	3.01	0.0029
C	3.07758	9.9356	0.00
R-squared		0.068716	
F-statistic		1.910237	

The model (1) with estimated coefficients is as follows:

$$GDP_{it} = 3.07758 + 0.018MC_{it}$$

According to the panel data analysis results for model (1), market capitalization is a significant variable influencing economic growth in individual economies. The value of the F-statistic shows that the model results are valid, while the p-value suggests that the coefficients are significant at a 1% confidence level. This shows that an increase in market capitalization by 10 percentage points can increase the annual economic growth rate in developing countries by 1.8%.

3.3. The role of the capital market in stimulating investments. Panel data analysis

A panel regression analysis was carried out to identify the effect of market capitalization on attracting investments in developing countries. The sample includes data from 27 developing countries from 2011 to 2019, as shown in section 2.

The Fixed Random effects sub-model was selected for estimating the regression model coefficients based on the result of the possible sub-models presented in the previous section. The model estimation results are shown in Table 2.

Table 2 Model (2) panel data regression results

Variable	Coeff.	t stat.	p-value
MC	0.0021	2.024	0.044
C	2.3775	14.721	0.00
R-squared		0.0029	
F-statistic		1.98056	

The model (2) with estimated coefficients is as follows:

$$FDI_{it} = 2.3775 + 0.0021MC_{it}$$

According to the panel data analysis results for model (2), market capitalization is a significant variable influencing the inflow of FDI in individual economies. The value of the F-statistic shows that the model results are valid, while the p-value suggests significant coefficients at a 5% confidence level. This result shows that an increase in market capitalization in developing countries by 10 percentage points can increase the inflow of FDI to GDP ratio by 0.21%. In this context, the research on the capital market integration issue in developing countries, particularly with a small

open economy and a low level of FDI inflow is quite relevant to stimulating FDI inflow, economic growth, and competitiveness.

3.4. Capital market development in developing countries

The deepening and development of capital markets are essential for the economic growth and stability of developing countries. To address this challenge, integrating the capital market into larger, regional, or global markets was recommended. The best choice would be a regional capital market integration considering the existing economic relations of individual developing countries with more developed partners. However, certain factors can hinder financial integration, such as institutional, legislative, and technical issues, as well as the macroeconomic environment.

The most severe institutional issue of many small developing countries is the high economic concentration in different sectors, especially the import of goods and services, allowing those with a dominant position to influence the financial market strongly. In addition, the unfavourable institutional and business environment hinders the economy's attractiveness to foreign investors. This is evidenced by the annual ratings carried out by international rating organizations, which can be eliminated through some legislative changes. There is a need to legislatively obligate that all banks (except subsidiaries of foreign banks) be open joint-stock companies. At the same time, one shareholder and affiliated persons should not have the right to own more than 4.99% of shares. The companies occupying a natural dominant position, regardless of the field of economic activity should also be legislatively obligated to become OJSCs. The requirement should also extend to organizations with liabilities exceeding their funds. This necessitates disclosure of substantial information, increases transparency, and enables public participation in profit distribution. In addition, there is a need to normalize the shares concentrated in the hands of one person. Regarding the macroeconomic environment, significant challenges include the limited depth of the financial market, the relatively small size of the capital market, and the typically dominant role of banks within the financial market.

In general, integrating capital markets is impossible without adequate technical support through digital technologies. The software must guarantee the free and fast flow of information between markets. Therefore, to overcome this issue, the countries should allocate the necessary financial resources for implementing the software used in the regional capital markets and put enough effort into the digitalisation process. The steps for the successful digitalisation of the capital market are described in Figure 4.

Figure 4 Capital market digitalisation process

Despite digitization being a critical factor for capital market development, it poses financial barriers for resource-constrained developing countries. The limited fiscal resources of these countries restrict the ability of public investments in digital technologies and infrastructure. Therefore, there is a need to consider the implementation of public-private partnerships to stimulate collaboration with the private sector, attracting companies and international organisations to share the burden of digitizing the capital market.

Another problem that resource-constrained developing countries may face is the shortage of skilled labour force to manage and maintain the implemented new digital systems. In this case, the government should organise capacity-building programs, especially for regulators and financial institutions to enhance technical expertise. Regarding legislative issues, the execution of an interstate memorandum with the selected country is necessary, providing for the following:

1. The placement of shares and debt securities listed on the selected country's capital market in the local secondary market should be allowed.
2. Records made by the central depository of the individual country should be recognized by the selected country and vice versa.

The citizens of developing countries are allowed to expand investment opportunities and participate in the distribution of profits, which will facilitate the investment process and capital movement between countries. This will also contribute to the formation of an investment culture among the population, thereby invigorating national issuers.

3.5. Discussion

The results of this research contradict the report of Gulay (2019). The research conducted a nonlinear autoregressive distributed lag model (NARDL) to estimate the relationship between economic growth and the stock market. The result showed an asymmetric relationship while this present research suggested the presence of a significant positive influence between the two variables. Contrary to Pan and Mishra (2018) who did not report a short-term relationship between market capitalisation and economic growth in China, this research suggests a positive relationship. These results were not consistent with the report of Kapaya (2020) who used the ARDL model to test the relationship between economic growth and stock market development in Tanzania. The analysis was carried out based on quarterly data from 2001 to 2019 and the result showed both negative and positive influence given the particular circumstances for short-run and long-run, respectively.

Bhattarai et al. (2021) estimated the relationship between these variables through an ARDL model on empirical data for Nepal from 1994 to 2019. The result found a long-run strong positive causality relationship between capital market to GDP growth. Another recent research carried out by Grbić (2021) on empirical data for the Republic of Serbia from 2002 to 2018 also confirmed the existence of a positive influence. Furthermore, the positive relationship between market capitalisation and FDIs was discussed by Samargandi et al. (2020), who observed similar trends in BRICS economies.

The current research results showed the role of digital technologies and regional integration as a pathway to economic growth in developing countries, including those with limited resources, a perspective that has been previously overlooked. These results suggested that implementing the recommendations developed within the research and attracting investments through public-private partnerships may enhance the positive effects of market capitalisation on economic growth (*ceteris paribus*). While this research assesses the effects of market capitalisation on economic growth (*ceteris paribus*), there are also other critical drivers, such as institutional quality, policy stability, and technological infrastructure that require special focus in future investigations. Previous research on the topic suggested that the higher institutional quality, the greater the capital market effects on economic growth (Ngare et al., 2014). Similar suggestions can be drawn for infrastructure that significantly improves the adoption of digital technologies in the capital market. Table 3 summarizes the literature review on the main channels of capital market influence on the economy in developing countries compared to the results of the present research.

Table 3 Literature review key results

Impact channel	Results	Authors
Access to capital	The capital market enables developing countries to raise capital to invest in productive sectors by also attracting foreign capital that can be used to invest in new technologies, expand existing businesses, and develop infrastructure. Access to capital can promote economic growth and stimulate job creation, leading to improved living standards for the population.	Ji (2010); Mcgowan (2008)
Better corporate governance	The capital market promotes better corporate governance by requiring transparency and disclosure of financial information. This boosts the confidence of investors and attracts more investments that can be used to finance new ventures and expand existing businesses. Improved corporate governance could also help reduce the risk of financial scandals, as well as damage the country's reputation and undermine investor confidence.	Ye et al. (2022), Eichengrin and Luengnarumitchai (2004)
Innovation and entrepreneurship	The capital market promotes innovation and entrepreneurship by financing businesses that want to invest in research and development. This can lead to the development of new products and services, stimulating economic growth and improving the country's competitiveness in the global market.	Bae et al. (2021)
Foreign investments	The capital market attracts foreign investment to developing countries, which can be used to finance economic growth. Foreign investors can access the capital market to invest in local companies that provide jobs and stimulate economic growth. This can also help increase capital flows into the country, improving economic performance.	Silva et al. (2023), Debata (2021), Bermejo et al. (2020), CMUR (2015)
Improving access to credit	The capital market can improve access to credit by providing an alternative source of financing for businesses. This reduces dependence on bank lending, often limited in developing countries. Improving access to credit can also help increase investments and improve economic growth.	Batten et al. (2023)

4. Conclusions

In conclusion, the weak development of the capital market in developing countries with small open economies had a significant negative influence on the investment environment, economic growth, and competitiveness. Investments from pension systems or savings were not converted into long-term domestic investments, instead being directed towards medium-term investments in bonds, cash, and deposits, or invested in foreign equities that accessed foreign capital markets. Furthermore, the underdevelopment of the capital market hinders the country's investment attractiveness for foreign investors. There was a need to develop a capital market that would be integrated with larger markets to overcome the issues. In particular, the integration of the regional capital market should be considered. Recommendations on a complex institutional reform of the sector have been developed to eliminate possible obstacles to financial integration in the direction of institutional, legislative, and technical issues. The research limitations included the probability of omitted variable bias, as only market capitalization was used to analyse the relationship between economic indicators and capital markets. This research did not incorporate the crisis of 2020 to avoid data distortions and statistical outliers. The possible directions for future research could include examining the influence of other capital market indicators and the developments after the COVID-19 pandemic.

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Author Contributions

Sandoyan E. and Rodionov D. were responsible for the concept and policy recommendations. Voslanyan M. has prepared the original draft, Galstyan A. conducted the regression analysis and prepared the final draft.

Conflict of Interest

The authors declare no conflicts of interest.

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