

Received: September 2024

Accepted: December 2024

DOI: 10.7862/rz.2024.mmr.20

CC-BY 4.0

Yassine MIMOUNI¹
Mouna BESSOUYAH²

FINANCIAL TECHNOLOGY INVESTMENTS AND THEIR IMPACT ON ECONOMIC GROWTH

This study aims to measure the impact of financial technology investments on economic growth around the world during the period (2014–2023). The error correction model ECM was used, and the results of the estimates showed that there is no causal relationship between the two variables in the short term; and after testing After valuation of transactions, it turned out that the error correction coefficient CointEq is negative and significant; this explains the existence of a long-term equilibrium relationship between the study variables, and from the test of the analysis of the statement, The shocks that reflect any change in the level of GDP variable by explaining the variance that the occurrence of any single structural shock in financial technology investments by 1% has a positive impact on GDP, and after analyzing the response functions to random shocks, it was found that the degree of response of both variables has been achieved since the first period.

Keywords: financial technology, investments, digitization gross domestic product, product joint integration.

1. INTRODUCTION

FinTech is one of the innovations of the emerging industry that has created wealth in global systems and provided a range of multiple services related to digital currencies, lending, or crowd funding. In this context, it aims to compete the traditional financial methods by boosting digital services and inclusive growth worldwide. The development of FinTech is closely related to the development of the enabling technologies (Kelvin, Anna, 2018). This innovation offers valuable opportunities to improve the financial sector because it supports green financial operations through green credit and investment (Minahil, Ayesha, Saba, Amir, 2023). In addition, the financial technology investments have contributed to the development of the financial sector by attracting start-ups for growth and significant returns.

Lately, researchers started focusing on the role of FinTech in improving the financial inclusion via digital access to the financial products and services in economies or regions

¹ Yassine Mimouni, Relizane University, Algeria; e-mail: yassine.mimouni@univ-relizane.dz (corresponding author). ORCID: 0000-0002-9031-8682.

² Mouna Bessouyah, Relizane University, Algeria; e-mail: bessouyah.mouna@univ-relizane.dz. ORCID: 0000-0002-6981-7145.

that have few financial institutions and/or less-developed financial markets (Joseph Jr, Behrooz, Hiroshi, 2023). Consequently, many countries have embraced the FinTech in order to contribute to the national economy and support the economic growth and the infrastructure. In this regard, the economic growth means constantly increasing the volume of production in a country or the gross domestic product because they are the main quantitative indicators of growth (Mladen, 2015).

As central banks began to adopt strategies aimed at enabling financial technology, startups emerged and started working for providing innovative financial services and products that simulate what the banking sectors offer, as they simplify access to financial and banking services. Because of the importance that the financial technology has received from central banks, as they are closely linked to raising countries' economic growth rates, it turned into a strategic goal that most banks seek to integrate and the use of financial technology to improve their performance rates. Based on what has been said, we shall shed light on the global investments in the FinTech sector and their impact on the economic growth global economic growth rates. In this context, we can raise the problematic of the study as follows:

This paper aims to give a comprehensive view of the development of FinTech investments around the world. by determining the relationship between FinTech investments and the world's economic growth based on the previous studies.

In order to test the hypotheses of the study and achieve its objectives, the methodology will be based on the description of the study variables and the analytical approach. Thus, we shall address the development of FinTech investments in the world. Besides, we shall rely on the investigative approach through the use of statistical analysis methods to study the relationship between FinTech investments and the global economic growth during (2014–2024).

Axes of the study:

The study revolves around:

Axis 01: Theoretical background of the study.

Axis 02: An econometric study of the impact of FinTech investments on the world's economic growth during 2014-2023.

2. LITERATURE REVIEW

FinTech has become an important modern technological tool in the provision of financial services and products because it includes innovative and advanced practices.

Concepts about the economic growth vary according to economists' perspectives. It is necessary to show two main points: firstly, such conceptions as “economic growth” and “economic development” should be distinguished, and secondly, in a variety of definitions of growth, as a rule, one or another essential characteristic of that category is reflected. (Aleksey, Yuner, 2015). In the economic theory, the concept of the economic growth implies an annual increase of material production expressed in value, the rate of growth of GDP, or in national income (Mladen M, 2015).

2.1. Financial technology and economic growth

According to multiple academic studies, investing in fintech has an important role in promoting economic growth by increasing GDP growth (Feyen et al., 2022; Haftto, 2019; Aker and Petty, 2010; Sahai, Ogawa, Khaira Wong, 2021). Moreover, several other researches have revealed a positive correlation between a country's income, measured by

GNI, per capita and the use of digital payment services, as determined by the percentage of individuals.

There are many papers investigating the relationship between FinTech and the economic growth, here are numerous research papers exploring the relationship between financial technology (FinTech) and economic growth.

This relationship is studied across various dimensions such as financial inclusion, efficiency of financial services, innovation, and impacts on traditional banking systems. Key areas of investigation often include Digital banking, online lending and payments programs, personal finance management, insurance and investment management. The study conducted by Hosen et al. (2023) Using a review methodology, this paper finds that, Hosen (2023) Fintech has potential to influence the realization of increase in financial development and economic growth, only when appropriate regulation is put in place. Important policy implications and future directions are discussed accordingly.

The study conducted by Andrea Rizova (2023) investigate the impact of financial technology and financial development on economic growth in countries with different levels of economic and financial development, The results prove that financial development does have a positive impact on GDP per capita growth, but FinTech does not. However, it is inferred that FinTech has a greater positive impact on economic growth in countries with higher level of financial development.

Research has shown that high adoption of fintech is associated with economic development in reverse with economic growth which plays an important role in driving the spread of Technology and innovation, including the adoption of digital payment (Andrea Rizova, 2023). Moreover, a study from Chinoda et al. (2023) found a two-way causal relationship between economic growth and digital financial inclusion. In addition, only a limited amount of research has shown that fintech positively impacts economic growth in countries with significant development in financial sectors.

Therefore, this research focuses on the impact of the volume of investments in financial technology on the rates of economic growth around the world as measured by the growth of the world's GDP.

2.2. Global investments in the FinTech

2023 has been a challenging year for the global fintech market, with both total fintech investment (\$113.7 billion) and the number of fintech deals (4,547) seeing their weakest results since 2017. Faced with a host of global challenges from a high interest rate environment and high inflation, to conflicts in Ukraine and the Middle East combined with concerns about valuations and an arid exit environment, fintech investors have become increasingly cautious with their investments.

Financial technology investments in the world have achieved several developments during (2014–2022). In this line, the period of 2014–2019 saw a fluctuation in the growth of FinTech investments in line with the tireless efforts made by the government agencies of various countries to create a conducive environment towards FinTech innovations, embrace new ideas, and adopt them in the financial sectors. Then, 2020 saw the largest peak in the volume of investments thanks to the efforts of the countries, mainly with the spread of the corona virus pandemic. Thus, the governments aimed at investing in digital finance, expanding the digital banking base, providing the attractive environment for investment, stimulating innovation in the areas of FinTech, launching innovative initiatives, focusing on block chain technology and artificial intelligence, and ensuring private sector engagement with FinTech companies.

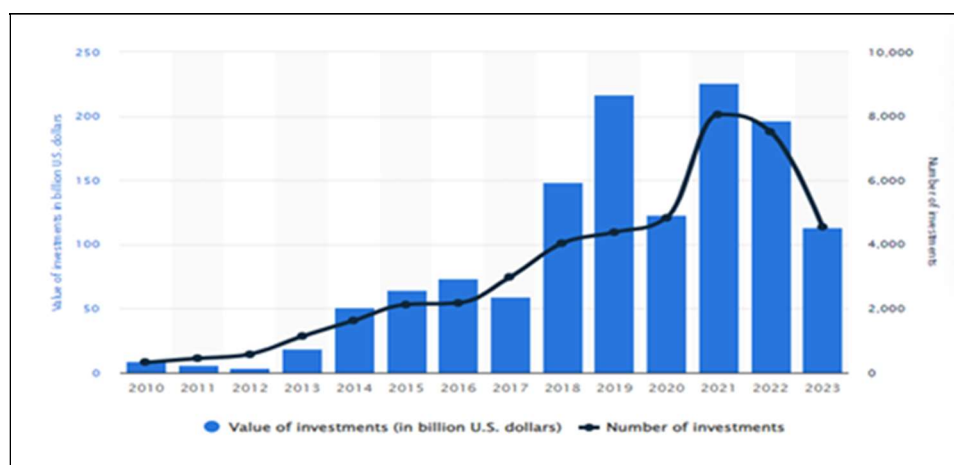


Figure 1. Provides an analytical view of the evolution of the global investments in the FinTech during (2010–2023) reference to the figure should be presented within the text

Source: <https://www.statista.com/> date of access 02/04/2024.

As for 2021 until the second semester of 2022, the volume of investments fluctuated due to the challenges in FinTech and the competition that emerged in the financial arena between the traditional banks and the emerging start-ups, as many banks began to rely on this technology for their new operations. In this line, despite the ongoing efforts to develop the digital systems and services, we still find gaps. The finance and financial technology sector is subject to frequent updates and amendments to existing rules, making ensuring continued compliance a challenge.

3. DATA AND METHODOLOGY

3.1. Data

Through the data available from the World Bank (world, 2023), we were able to find the most important indicators related to our study, which are mainly related to investments in financial technology and the rate of economic growth in the world and measured by GDP, where we can find different indicators, such as the Global Financial Inclusion Index and the Global Development Indicators, which provide valuable insights for research on various social and economic topics.

For this research, the dependent variable of economic growth depends on the measure of the growth of the world's GDP.

The main independent variable of the study is investment in financial technology and metrics are calculated from this variable by key points (fintech deals, Payments space, Blockchain and crypto space investment). In light of this, the world record of Global investments in FinTech reached over US\$210 billion in 2021. Key highlights include:

- Record 5,684 fintech deals drove the investment.
- Payments space saw US\$ 51.7 billion in investment.
- Blockchain and crypto space investment soared from US\$ 5.5 billion in 2020 to US\$ 30.2 billion in 2021, However, in 2022, global investment in FinTech dropped by 30% from 2021.

3.2. Methodology

With the aim of studying the impact FinTech investments on the world's economic growth during 2014–2023 and the causal relationship between the two variables, we used the Error Correction Model ECM.

$$\text{GDP} = F(\text{FI}) \quad (1)$$

$$\text{id} \quad [= \beta_0 + \beta_1 \text{inf} + \epsilon_t] \quad (2)$$

Where:

- FI: Size of FinTech Investments;
- $\beta_0 \beta_1$: The model's parameters;
- ϵ_t : random error.

This model relies on FinTech investments as an interpretive variable of economic growth, while neglecting the rest of the variables that fall within the protector of the model. In order to determine the impact of the independent variables on the dependent variable, we formulate the following function:

$$\text{GDP}(t) = f(\text{FI}(t), \text{rsd}) \quad (3)$$

where:

- The economic growth (GDP): dependent variable;
- The financial technology investments FI (t): the independent variable interpreted for the affiliate variable;
- t: Random error.

For our empty study, the impact of fintech investments will be illustrated by relying on the latter's global index of GDP expressed in economic growth, by examining their causal relationship.

The following table shows the study's variables:

Table 1. Study Variables

Data Source	Type	Variable Code	VARIABLE
IIFM	independent variable	FI	fintech investments
(WDI)	dependent variable	GDP	economic growth

Source: Prepared by the researchers using EViews12 program.

Stability test of the time series of the study variables:

In order to recognize the degree of integration of time series for study variables by verifying the absence of mono root, we used the ADF test. Table 2 shows the results of the test.

Table 2. Results of Unit Root Test Using ADF

Variable	Unit Root Test Using ADF								
	Intercept			Trend and Intercept			None		
	ADF	Level 5%	Prob	ADF	Level 5%	Prob	ADF	Level 5%	Prob
<u>GDP</u>	-7.708977	-3.661661	0.0000	-7.705894	-3.568228	0.0000	-7.727446	-1.952066	0.0000
<u>FI</u>	-9.524849	-2.951125	0.0000	-9.391658	-3.548490	0.0000	-9.664393	-1.951000	0.0000

Source: Prepared by the authors using EViews12 program.

The chain associated with the GDP variable is stable at the first difference i.e. the value 7.70 = T-Statistic (in absolute terms) is greater than the table value 3.66. This is explained by the probability of this test Prob = 0.0000. It is less than the 0.05 and, therefore, we can say that the series does not have a root 1 unit.

- The chain associated with the FIP variable is stable at the first difference i.e. the value of 9.52 = T-Statistic (in absolute terms) is greater than the table value 2.95. This is explained by the probability of this test Prob = 0.0000. It is less than 0.05 and, therefore, we can say that the series does not contain a root of the unit (hence 1 i) and that it is stable. Thus, we can say that both series are complementary with the same degree I (1).

Granger Causality Test:

This test refers to the study of the relationship direction between FinTech investments and GDP:

Table 3. Granger Causality Tests

Causal Direction	F-Statistic	Prob
FI does not Granger Cause GDP	0.49306	0.6168
GDP does not Granger Cause FI	1.52767	0.2374

Source: Prepared by the researchers using EViews12 program.

Based on the results of Granger Causality Tests, we find that:

- Test (1) examines the causality of FI on GDP. Thus, we notice that Prob = 0.6168 and accept the null hypothesis that states that FI does not cause GDP. Therefore, there is no causal link between FinTech investments and GDP.
- Test (2) examines the causality of GDP on FI. Thus, we notice that Prob = 0.2374 and accept the null hypothesis that states that GDP does not cause FI. Therefore, there is no causal link between FinTech investments and GDP.

As a result, we conclude that there is no two-way causal correlation between FinTech investments and GDP.

Johansson co-integration test:

After checking that the two series (FI, GDP) are top-notch integrals I (1), we conduct the Johansen Juselius co-integration test to check whether there is a long-term co-integration:

Table 4. Co-integration Test Results

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.843291	64.5074	15.49471	0.0000
Atmost 1 *	0.309960	10.75915	3.841465	0.0010
Trace test indicates 2 co integrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level ** MacKinnon-Haug-Michel is (1999) p-values				
Unrestricted Co-integration Rank Test (Maximum Eigen value)				
Hypothesized	Eigen value	Max-Eigen Statistic	0.05Critical Value	Prob**.
None	0.843291	53.74759	14.26460	0.0000
Atmost 1*	0.309960	10.75915	3.841465	0.0010
Max-eigen value test indicates 2 co integrating eqn (s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

Source: Prepared by the researchers using EViews12 program.

Based on the results of the co-integration test, we see that:

- At None *, the result of the first test is significant because the Prob value is equal to 0.0000. Therefore, we refuse the null hypothesis that states that there is no long-term balance relationship, and accept the alternative hypothesis that states that there is a long-term balance relationship. As shown in the table above, the calculated value of the impact test is 64.5074, which is greater than the table value 15.49471 at significance level 5%. Thus, there is a co-integration.
- At Atmost 1*, the result of the first test is significant because Prob=0.0000. Therefore, we refuse the null hypothesis that states that there is one long-term balance relationship, and accept the alternative hypothesis that states that there is a long-term balance relationship. As shown in the table above, the calculated value of the impact test is estimated at 10.75915.

Thus, we conclude that there are two complementary relationships between the study variables. Therefore, we can apply the causality test in order to know the direction of the long-term relationship and the impact between the variables.

Determination of the model's delay scores:

In order to estimate the Variant-oriented self-regression model, we shall rely on AIC and SC criteria to determine the optimal slowdowns.

Table 5. Results of the Model Delay Score

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-196.1711	NA	2955.066	13.66698	13.76127	13.69651
1	-166.1968	53.74718	493.4247	11.87564	12.15853	11.96424
2	-126.1264	66.32340*	41.23262*	9.388026*	9.859507*	9.535388*

Source: Prepared by the authors using EViews12 program.

Table 5 shows that the number of the optimal delays of the study variables is 2. Thus, we can estimate the ECM model through the delay period (2).

Estimating the ECM model:

After confirming the stability of the time series and determining the degree of delay, we will estimate the ECM model through the co-integration test. Table 6 shows the results of the test:

Table 6. Results of estimating ECM

Vector Auto-regression Estimates Date: 11/11/22 Time: 18:19 Sample (adjusted): 2014Q2 2022Q2 Included observations: 29 after adjustments Standard errors in () & t-statistics in []		
FI	GDP	
-14.90748 (9.29800)]-1.60330[	2.101395 (0.06606)]31.8114[	GDP(-1)
12.91859 (10.0795)]1.28167[	-1.346775 (0.07161)]-18.8070[	GDP(-2)
0.043886 (0.20404)]0.21509[	-0.000569 (0.00145)]-0.39280[	FI(-1)
0.020261 (0.20868)]0.09709[	0.001381 (0.00148)]-0.28642[	FI(-2)
34.66517 (15.4091)]2.24965[	0.669137 (0.10947)]6.11226[	C
0.157101	0.991802	R-squared
0.016618	0.990436	Adj-R squared
18612.11	0.939437	Sum sq.resids
27.84788	0.197846	S.E equation
1.118291	725.9300	F-statistic
-134.8812	8.582459	Log likelihood
9.646976	-0.247066	Akaike Aic
9.882717	-0.011325	Schwarz SC
34.58966	2.177940	Mean dependent
28.08219	2.023084	S D dependent

Source: Prepared by the authors using EViews12 program.

Economic analysis: Based on the results of the estimation of ECM, the determination factor is 0.99, i.e., FinTech investments explain the economic growth at 99%. Besides, Fisher's calculated value is greater than the table value. This means that the study model has statistical significance.

Residual Serial Correlation LM Test:

In order to confirm that there are no problems with the self-correlation of the study model, we use VAR Residual Serial Correlation LM Test.

Table 7. Results of Residual Serial Correlation LM Test

Lags	LRE*STAT	RAOF-STAT	DF	Prob
1	34.10687	12.70942	4	0.4957
2	3.439790	0.874459	4	0.4873
3	11.57014	3.241882	4	0.2209

Source: Prepared by the authors using EViews12 program.

The table 7 shows that:

All the probabilities (Prob) are insignificant (greater than 0.05). Therefore, we accept the null hypothesis that states that the estimated model is free from the problem of self-association of errors (the residuals are not self-related).

ECM model validity test:

We conduct the heterogeneity test to know whether the study model has a problem of heterogeneity.

Table 8. Heterogeneity Test Results

Chi-sq	df	Prob
38.40623	24	0.3315

Source: Prepared by the authors using EViews12 program.

The table shows that:

- Prob's value for Ch-Sq has reached 0.3315, which is greater than 0.05 (insignificant). Therefore, we refuse the problem of non-heterogeneity and accept the hypothesis of the constancy of the variance of the error limits of the estimated model.

Diagnosis of ECM model:

In order to check the extent to which the residuals series follow the normal distribution model, we shall use the following tests:

The tests of the residuals' natural distribution:

We conduct Skewness, Kurtosis, and Jarque-Bera natural distribution tests in order to test the null hypothesis that states that the chain of the residuals is subject to natural distribution. The tables 9, 10, and 11 show the results of the tests:

Table 9. Skewness Test Results

Component	Skewness	Ch-sq	df	Prob*
1	1.328755-	3.135028	1	0.3435
2	0.333900	62.98438	1	0.5468
Joint	3.8745123		2	0.8703

Source: Prepared by the authors using EViews12 program.

Table 10. Kurtosis Test ResultsThe second paragraph

Component	Kurtosis	Ch-sq	df	Prob*
1	3.652978	0.287415	1	0.4789
2	2.112547	0.547458	1	0.7425
Joint	0.924785		2	0.9714

Source: Prepared by the authors using EViews12 program.

Table 11. Jarque-Bera Test Results

Component	Jarque-Bera	df	Prob*
1	1.183524	2	0.2027
2	2.641648	2	0.4521
Joint	4.251478	4	0.6348

Source: Prepared by the authors using EViews12 program.

The tables show that the residuals are subject to the natural distribution because:

- The value of Skewness is 3.8745123;
- The value of Kurtosis is 0.924785;
- The value of Jarque-Bera 4.251478.

The results show that Pvalues in the three tests are insignificant, i.e., $P \geq 0.05$. Therefore, we accept the null hypothesis that states that the residuals are subject to natural distribution, and refuse the alternative hypothesis that states that the residuals are not subject to natural distribution.

Unit root test:

- This test ensures the stability of the model, as shown in figure 2.

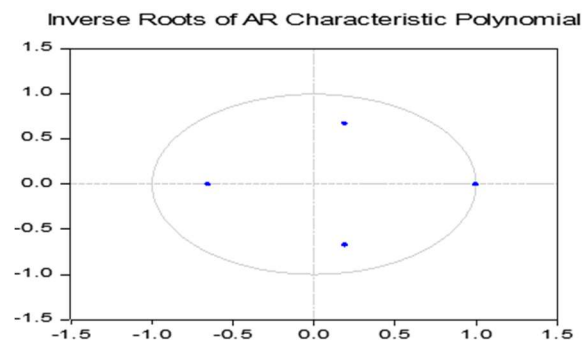


Figure 2. Unit root test results

Source: own processing.

Based on the results shown in the figure, the ECM model meets the requirements of stability. Since the roots are within critical limits, the model is stable.

The parameters significance test:

Table 12. Results of the parameters significance test

Co-integratingEq:	CointEq1		
GDP(-1)	1.000000		
FI(-1)	0.012535- (0.00892) [1.40494-]		
C	1.835312-		
Error Correction:	D(GDP)	D(FI)	
CointEq1	-0.733484 (0.04083) [3.26948]	1.988895 (13.9929) [0.14214]	
D(GDP(-1))	2.070052 (0.08522) [24.2905]	14.42100- (29.2079) [0.49374-]	
D(GDP(-2))	1.852508- (0.20014) [9.25598-]	6.379396 (68.5953) [0.09300]	
D(FI(-1((	0.001548 (0.00076) [2.04551]	0.662135- (0.25933) [2.55328-]
D(FI(-2))	0.001702 (0.00065) [2.61095]	0.364949- (0.22342) [1.63350-]	
C	0.133499- (0.03559) [3.75056-]	1.386067 (12.1994) [0.11362]	
	0.364293	0.987114	R-squared
	0.219815	0.984185	Adj. R-squared
	23068.02	0.196380	Sum sq. resids
	32.38127	0.094479	S.E. equation
	2.521433	337.0548	F-statistic
	-133.7263	29.70843	Log likelihood
	9.980447	-1.693459	Akaike AIC
	10.26592	-1.407987	Schwarz SC
	0.900000	-0.118516	Meandependent
	36.66021	0.751289	S.D. dependent

Source: Prepared by the authors using EViews12 program.

Table 12 shows that after the CointEq, ECM is negative (0.73348) and significant at a level of 5%. This is explained by a long-term balance between the variables in question, i.e. the long term of FinTech investments explains 73% of the economic growth changes, and any imbalance in any variable will be corrected in order to maintain the long-term balance.

Wald Test:

It tests the significance of the parameters in the short-term, i.e. the test of the probability that FinTech investments will not affect the economic growth in one short-term delay.

Table 13. WALD Results (Short Term significance)

Test Statistic	Value	df	Probability
Chi-square	21.25673	3	0.0001

Source: Prepared by the authors using EViews12 program.

Table 13 shows that:

- Prob value = 0.0001 is significant (less than 0.05). This means that there can be no parameters for FinTech investments in the economic growth.

Analysis of response functions:

ECM self-declining vector model allows analysis of random shocks by measuring a sudden impact (shock) in a variable on other variables(djalti)in order to follow the time path of shocks occurring at the random error level to which the study variables are exposed, and know how to respond. Let us consider figure 3.

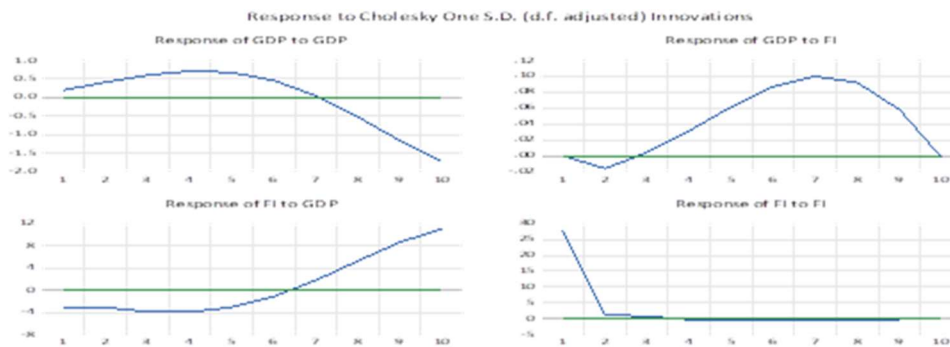


Figure 3. Results of the Analysis of the Random Shock Response Function Test

Source: own processing.

Any shock to GDP with a standard deviation of 01 will affect FinTech investments. In addition, FinTech investments' response to the change in GDP was initially in decline (negative). The second curve shows that GDP responds to the change in FinTech investments at the same pace of curve 01. Thus, the response of both variables (FI and GDP) has confirmed since the first period. Moreover, any structural shock of 1% in FinTech investments has a positive impact on GDP.

Analysis of variance:

Analysis and fragmentation of variance means measuring the percentage of variance that interprets each internal variable compared to itself and other variables, i.e. knowledge of the degree of the impact between the variables (independent variable and its interpreting variables).

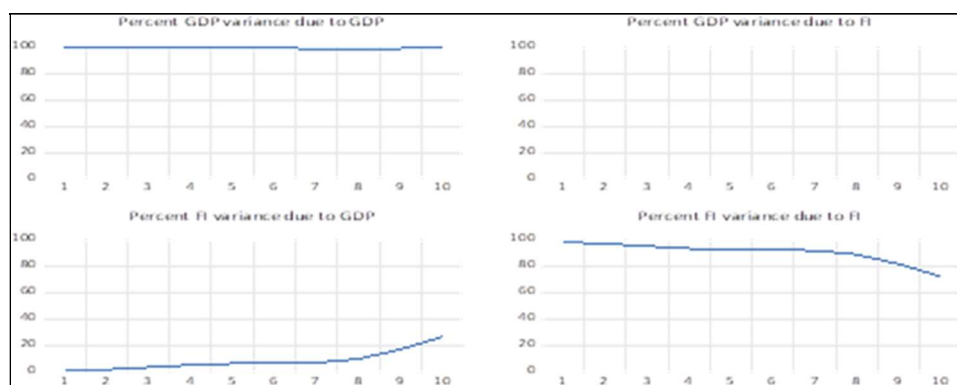


Figure 4. Variance analysis results

Source: own development.

Figure 4 shows that:

- The shocks effectively contribute to the GDP by explaining the variance of the FinTech investments in the long term more than in the short term. Furthermore, any sudden changes (shocks) in the GDP will affect FinTech investments.
- They also contribute effectively to the variance of FinTech investments by explaining the variance of the GDP in the long term more than in the short term. Furthermore, any sudden changes (shocks) in FinTech investments will affect the GDP.

4. THE RESULTS OF THE ECONOMETRIC STUDY

Based on standard modeling, time series stability testing, and the degree of integration of the variables, we see that:

- Both series (GDP) and (FI) are complementary with the same degree I (1). Based on the results of the test of delays, AIC, and SC criteria, the optimal number of delays for the study variables is 2.
- Based on the results of Granger Causality Test, there is no two-way causal correlation between GDP and FinTech investments in the short term. In addition, after the co-integration test, there were two complementary relationships between the study variables. This allows us to apply the causality test to know the direction of the long-term relationship and the impact between the variables.
- Through the LM Test, the estimated model is free from the problem of self-correlation of errors (the residuals are not self-related).
- After conducting the validity tests of the ECM model, the estimated model meets the conditions of stability and does not show problems of non-heterogeneity or self-association.
- After the significance test, the Coint Eq error is negative (0.73348) and significant at 5%; this is explained by a long-term balance between the variables in question.
- The results of WALD test (short-term significance) show that FinTech investments have no parameters in the GDP.
- After analysis of the functions of the response to the random shocks, the degree of response of both variables has achieved since the first period. Moreover, any sudden

shock with a standard deviation at 01 on the financial technology investment (FI) positively affects the GDP.

- The analysis of the variance test shows that the shocks effectively contribute to the GDP through explaining FinTech investments. In addition, any single structural shock of 1% in FinTech investments has a positive impact on the GDP.

5. CONCLUSION

The FinTech sector is rapidly growing all over the world. It offers a range of modern technologies and provides financial services and products, including innovative and sophisticated practices designed to provide new or existing financial products and services that will stimulate the financial development and the economic growth. This paper was an econometric study of the impact of FinTech investments around the world's economic growth during 2004–2023. It used the ECM and focused on a range of variables, namely, FinTech investments (FI) and GDP. According to the results obtained:

- The results of the causality test show that there is no causal link between the FinTech investments and the short-term economic growth. This disconfirms the first hypothesis.
- The test of random shock response functions and the variance analysis show a positive effect between FinTech investments and the economic growth rates. This confirms the second hypothesis.

Based on the results of our study, there are some recommendations and suggestions for future research:

Recommendations and suggestions:

- In order to enhance the world's FinTech, we need financial education initiatives (known as digital literacy), consumer protection measures to build trust in digital systems, and many initiatives to reduce the digital knowledge gap.
- Government agencies must provide the necessary support to stimulate the growth of the FinTech sector and develop flexible legal and legislative frame works that are clear and transparent.
- It is necessary to take advantage of each other's experiences in digital solutions, mainly after COVID-19 that led to developing programs and policies to mainstream digital FinTech services.

Acknowledgements

Author Contributions: Introduction: Y.M., M.B.; Literature Review: Y.M., M.B.; Gaps in Literature: Y.M., M.B.; writing-review and editing: Y.M., M.B.; Methodology: Y.M., M.B.; Results: Y.M., M.B.; Conclusion: Y.M., M.B.; References: Y.M., M.B.; Collation of inputs from the Co-authors: Y.M., M.B.

Funding: Authors declare that there were no sources of funding or supporting agencies.

Data Availability Statement: Authors declare that the data to empirically examine the objectives of this article or the gaps identified were obtained through our own research.

Conflicts of Interest: The authors declare no conflicts of interest.

All authors have read and agreed to the published version of the manuscript.

REFERENCES

- Aleksey, P., Yuner, K. (2015). *Economic Growth: Types and Factors*. International Conference on Eurasian Economies. Russia. Access on the internet: <https://www.avekon.org/papers/1404.pdf>.
- Al-Sharafi, M.A. et al. (2023). *The Influence of FinTech on Financial Sector and Economic Growth: An Analysis of Recent Literatur*, (Eds.): ICETIS 2022, LNNS 584. DOI: 10.1007/978-3-031-25274-7_21.
- Anabela S.S.Q., Aurora A.C.T. (2014). *Economic Growth, Human Capital and Structural Change: An Empirical Analysis*. FEP-UP. "School of Economics and Management". Access on the internet: <https://ideas.repec.org/p/por/fepwps/549.html>.
- Chatchai Khiewngamdee, D.H.-D. (2019). *The Role of Fintech E-Payment on APEC Economic*. Dans J.O. Series (Éd.), The Second International Conference on Physics, Mathematics and Statistics. Access on the internet: <https://wps.fep.up.pt/wps/wp549.pdf>.
- Erik, F., Harish, N., Matthew, S. (2023). *Fintech and the Future of Finance Market and Policy Implications*. Washington: The World Bank Group. Access on the internet: <https://documents1.worldbank.org/curated/en/099450005162250110/pdf/P17300600228b70070914b0b5edf26e2f9f.pdf>.
- Guangyou, Z., Jieyu, Z., Sumei, L. (2021). *The Impact of Fintech Innovation on Green Growth in China: Mediating Effect of Green Finance*. "Ecological Economics". Access on the internet: DOI: 10.1016/j.ecolecon.2021.107308.
- Investopedia (2021). [Access: 7.10.2023]. Access on the internet: <https://www.investopedia.com/terms/e/economicgrowthrate.asp>.
- Jamie, E., Steve, B. (2021). *Fintech: A Guide to Financial Technology*. The House of Commons Library. Access on the internet: <https://researchbriefings.files.parliament.uk/documents/CBP-9150/CBP-9150.pdf>.
- Joseph, A. Jr, Behrooz, A., Hiroshi, I. (2023). *Does Fintech Penetration Drive Financial Development? Evidence From Panel Analysis of Emerging and Developing Economies*. "Borsa Istanbul Review". DOI: 10.1016/j.bir.2023.06.001.
- Kelvin, L., Anna, S. (2018). *Fintech (Financial Technology): What Is it and How to Use Technologies to Create Business Value in Fintech Way? "International Journal of Innovation, Management and Technology"*. Access on the internet: <https://www.ijimt.org/vol9/791-M775.pdf>.
- Minahil, A., Ayesha, A., Saba, F., Amir, H. (2023). *Is Fintech the New Path to Sustainable Resource Utilisation and Economic Development? "Resources Policy"*. DOI: 10.1016/j.resourpol.2023.103309.
- Mladen M.I. (2015). *Economic Growth and Development*. "Journal of Process Management – New Technologies, International". Access on the internet: <https://drive.google.com/file/d/1-tn17-06Yyxd2U3usfti0NZZ75QEPGY/view>.
- Nawazish, M., Mohamed, E., Muhammad, U., Noura, M. (2023). *Safeguarding Fintech Innovations with Machine Learning: Comparative Assessment of Various Approaches*. "Research in International Business and Finance". DOI: 10.1016/j.ribaf.2023.10200.
- Thomas, N.M. (2023). *Modeling key enablers influencing FinTechs offering SME credit services: A multi-stakeholder perspective*. "Electron Markets", 33, 18. DOI: 10.1007/s12525-023-00627-6.
- Werth, O., Cardona, D.R., Torno, A. et al. (2023). *What determines FinTech success? – A taxonomy-based analysis of FinTech success factors*. "Electron Markets", 33, 21. DOI: 10.1007/s12525-023-00626-7.

