INTERNATIONAL JOURNAL OF BUSINESS & ECONOMIC STUDIES

Volume: 4, Issue:1, Year 2022

E-ISSN: 2718-0247

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INTERNATIONAL JOURNAL OF BUSINESS & ECONOMIC STUDIES

BES JOURNAL

Year: 2022 - Volume: 4 - Issue: 1

ISSN: 2718-0247

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International Journal of Business & Economic Studies
Year: 2022, Vol: 4, No:1, pp.1-10
https://doi.org/10.54821/uiecd.1084352

The Energy Crises and Contagion from Europe to World: Evidence via Stochastic Volatility Model

Avrupa'dan Dünya'ya Enerji Krizleri ve Bulaşıcılık: Stokastik Oynaklık Modeliyle Kanıtlar

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Received : 07.03.2022
Revised : 10.05.2022
Accepted : 27.06.2022
Type of Article : Research

Keywords:

Stochastic Volatility Model

Henry Hub

Natural Gas

Energy Crisis

Jel Codes:
K32, P18, Q43

ABSTRACT

The new period, which started with the increase in energy prices in Europe, turned into a crisis in a short time and had a serious negative impact on the locomotive economies of the continent. Russia's attempts to reduce the amount of supply, despite the increasing energy demand of the European economies in the recovery effort, appear as the trigger of the crisis process. In this direction, a process has emerged in which we have witnessed the increasing tensions between major European economies and Russia, especially since the second half of 2021. On the other hand, the large increases in energy prices in a short time created the effect of gasoline spilled on the fire in the increase of tensions between the parties. Therefore, the effect of the 2021 energy crisis on the global scale has become inevitable. In the light of all these, first, it was discussed the effect of the European energy crisis on the price changes in the world's leading markets . In this context, important natural gas market data of Europe was evaluated with American and Asian spot and benchmark prices. In the light of the data obtained, the existence or nature of the correlation were analyzed between the price movements in these three important natural gas markets systematically. TTF and Henry Hub are the two important markets to be covered in the analysis. In the light of all these, in the study, it was analyzed whether the process that emerged in Europe, has affected other market prices via the Stochastic Volatility Model. It was found that TTF, Henry Hub and JKM companies, which supply gas to the European market, increased their share returns between 01.12.2017 and 01.12.2021 (crisis periods).

Anahtar Kelimeler:

Stokastik Oynaklık Modeli

Henry Merkezi

Doğal Gaz

Enerji Krizi

Jel Kodları:
K32, P18, Q43

ÖZET

Avrupa'da enerji fiyatlarının artması ile başlayan yeni dönem kısa sürede krize dönüşerek kıtanın lokomotif ekonomilerini ciddi bir şekilde olumsuz etkilemiştir. Avrupa ekonomilerinin toparlanma çabaları çerçevesinde artan enerji taleplerine rağmen Rusya'nın arzı azaltma girişimleri kriz sürecinin tetikleyicisi olarak görülmektedir. Bu doğrultuda özellikle 2021'in ikinci yarısından itibaren büyük Avrupa ekonomileri ile Rusya arasında artan bir gerilim yaşanmaktadır. Diğer yandan enerji fiyatlarında kısa sürede yaşanan büyük artışlar taraflar arasındaki gerilimin artmasına neden olmuştur. Bu nedenle küresel ölçekte 2021 enerji krizinin etkisi kaçınılmaz duruma gelmiştir. Tüm bunların ışığında ilk olarak araştırmada Avrupa enerji krizinin dünyanın önde gelen piyasalarındaki fiyat değişimlerine etkisi tartışılmıştır. Bu kapsamda Avrupa'nın önemli doğalgaz piyasası verileri Amerika ve Asya spot ve karşılaştırmalı fiyatları ile değerlendirilmiştir. Elde edilen veriler ışığında bu üç önemli doğal gaz piyasasındaki fiyat hareketleri arasındaki ilişkinin varlığı veya niteliği sistematik olarak analiz edilmiştir. TTF ve Henry Hub, analizlere dahil edilen iki önemli pazardır. Tüm bunların ışığında çalışmada, Avrupa'da ortaya çıkan sürecin diğer piyasa fiyatlarını etkileyip etkilemediği Stokastik Oynaklık Modeli ile analiz edilmiştir. Avrupa pazarına gaz arzı sağlayan TTF, Henry Hub ve JKM şirketlerinin 01.12.2017 ile 01.12.2021(kriz dönemleri) tarihleri arasında hisse getirilerini arttığına dair bulgulara ulaşılmıştır.

Suggested Citation: Erkan, A. Ç., Ergüney, E. B. & Gürsoy, S. (2022). The Energy Crises and Contamination from Europe to World: Evidence via Stochastic Volatility Model. *International Journal of Business and Economic Studies*, 4(1), 1-10, Doi: https://doi.org/10.54821/uiecd.1084352

1.INTRODUCTION

Natural gas markets have been developing significantly in the recent period. It is indisputable that the increasing importance of natural gas in the eyes of consumers and the increasing quality of its functional contribution to the sustainability of economic activities have been extremely influential in the development process. In this direction, it is possible to state that the natural gas trade has developed on an international scale and has reached a lower level of the oil markets.

A very important issue related to the development of natural gas markets is the witnessing of changes in connection with the dynamism of the international arena. One of the typical features of natural gas markets activities within the framework of long-term contracts. However, especially in the last period, it has been witnessed that long-term contracts and price formulas have undergone great changes. In this context, it is possible to say that old habits have lost their effectiveness in today's trade style and have undergone a significant transformation. Nevertheless, it is extremely difficult to talk about a mature market mechanism and structure for the trade of natural gas. However, this expression does not mean that there is no formation in which natural gas is treated as a commercial commodity. So much so that today there are several important formations in which commercial activities related to natural gas are carried out. However, it is seen that these formations were operated in isolation from each other until recently. In this respect, we can say that the natural gas trade, which does not have a fully developed market mechanism yet is traded on platforms with its own characteristics in the international arena. Henry Hub, Title Transfer Facility (TTF) and Japan Korea Marker (JKM) are such important platforms. However, it should be underlined that TTF, Henry Hub and JKM operate in isolation from each other.

The main motivation of the study is that TTF, Henry Hub and JKM are separate entities. In this context, in this study, the nature of these disjointed formations is questioned in today's conditions where globalization has spread to every field. Therefore, the main claim of the study will be questioned the generally accepted assumptions and common beliefs in the literature that natural gas markets operate in isolation from each other. The main reason for this is that almost all the literature studies deal with the subject with qualitative methods and the deficiencies in the analysis through a quantitative systematic model. In the light of all these, the effect of the process that emerged in Europe on energy prices in the world's important markets will be analyzed using the "*Stochastic Volatility Model*".

2. NATURAL GAS AS A STRATEGIC ENERGY SOURCE

Natural gas is one of the hydrocarbon-based energy sources. And its formation dates back millions of years like oil (Demir, 2015:5). In direct proportion to natural gas, which build up to a part of daily life mostly for domestic activities and became one of the key inputs of activities in many fields. Eventually, global consumption of natural gas has increased, and it has become one of the dynamics that directly affects the developments in the international arena.

The qualities of natural gas play an important role in the worldwide increasing consumption. It is possible to deal with these characteristics of natural gas under two headings: structurally and functionally. First, its structural features, the most important characteristics of natural gas are that it is a significant substitute for petroleum, and it is one of the clean energy sources. The reason is that the main content of natural gas consists of one carbon atom and four hydrogen atoms. Natural gas, which is colorless, odorless, and tasteless also its pollutant effects after combustion is at very low levels compared to the other hydrocarbon-based sources. In fact, it is clearly seen that natural gas is very advantageous in terms of environmental factors compared to oil and coal. For instance, compared to the use of coal to achieve the same heat values, natural gas absorbs 50 percent less carbon dioxide and 20 percent less nitrogen oxide, which is one of the indicators of this (Demir, 2015: 7). Herein another title in the characteristics of natural gas emerges. It is possible to relate these qualities, which we can consider under the heading of effects, to externalities in a way. These externalities are mostly associated with climate change. Therefore, it is possible to discuss the important roles it played in reducing the problems that negatively affect energy security, especially its positive contribution to environmental negativities, under this heading. It is inevitable that natural gas will be among the strategic energy sources that are increasingly preferred in electricity generation, industry, and related sectors in many geographies of the world. The fact that natural gas has become one of the strategic energy resources will be more understandable when evaluated together with the activities around the world.

2.1. General Outlook of Natural Gas Activities

Following the first oil crisis in 1973, the importance of energy was better understood by all the countries of the world. However, countries have taken important steps in the diversification of energy resources and the use of alternative energy resources, especially energy importing countries have undertaken various policies for the sustainable use of energy (Gürsoy, 2021: 70).

As a result of the diversification strategy, with the energy security threats becoming more evident after the crises experienced since 1973, the increasing trend towards natural gas has become a resource that is consumed in size, especially since the 21st century. However, the demand for natural gas, which is in the top three of the world's primary energy mix, is expected to increase faster than oil and coal in the medium and long term due to the decrease in prices, the abundance of supply and its role in reducing carbon emissions. The expected increase is expressed as approximately 50 percent over a 25-year period. In sum, there is a noticeable increase in activities related to natural gas, which is one of the strategic energy sources. Although it is at lower levels compared to oil, it is possible to state that the global development of natural gas has the potential to overtake coal.

Colorless, odorless, and non-toxic natural gas is also called "blue fire" because of the color it takes when burned. Blue fire, which is chemically a derivative of petroleum, is asymmetrically distributed over the earth's surface, just like other fossil energy sources. Inferences obtained from statistical data are among the most important indicators of the said asymmetrical distribution. Total natural gas reserves of the world, which is declared as 196.6 trillion m^3. Its distribution is as follows: 75.5 trillion m^3 is at the Middle East, 66.7 trillion m^3 is at Europe and the Commonwealth of Independent States, 18.1 trillion m^3 is Asia-Pacific, 14.4 trillion m^3 is in Africa, 13.9 trillion m^3 is in North America, 8.2 trillion m^3 is in Central and South America. Also, distribution as a percentage of total world natural gas reserves is as follows: 38.4 percent in the Middle East, 33.9 percent in Europe and the Commonwealth of Independent States (CIS), 9.2 percent in Asia-Pacific, 7.3 percent in Africa, and 7.1 percent in North America. and 4.2 percent is the geography of Central and South America (BP, 2019: 30).

For natural gas, data on production and consumption are guiding light. First, it is witnessed that the production of natural gas in the last ten years has increased worldwide. The annual average increase in natural gas production between 2009 and 2021 is expressed as 3.3 percent. In this context, the region in the first place regarding natural gas production activities for 2020 is 28.8 percent North America. The CIS geography ranks second and third, respectively, with a share of 20.8 percent and the Middle East with a share of 17.8 percent. When considered in terms of consumption, the resulting ranking is North America (27 percent), Asia-Pacific (22.5 percent) and the Middle East (14.4 percent). The annual increase in natural gas consumption in the last ten years has been expressed as approximately 3 percent (BP, 2021: 37).

2.2. Overview of LNG Activities

The problems that have arisen in connection with the increase in the consumption of natural gas have brought about the search for different alternatives on a global scale. In other words, along with the advantages of natural gas, some disadvantages have emerged due to its qualities. And there has been a tendency towards alternatives to minimize the negative effects. It is possible to deal with the negativities related to the qualities of natural gas within the framework of transportation and storage. As it is known, natural gas is an energy source that cannot be stored in large quantities and can be transported most efficiently through natural gas pipelines. Its qualities in this context directly transform natural gas into an entity that can be politicized between producer and consumer economies. Therefore, while some of the characteristics of natural gas contribute positively to energy security, others make it a source of threat. It is possible to consider the energy crises related to natural gas between Russia and European countries and the statements in the literature that it has turned into a weapon in this context. Therefore, the serious negative impact of these events on energy security has made it inevitable for alternatives to come to the fore.

Contrary to expectations, the emergence of alternatives has not been within the framework of a new energy source. In this context, it is possible to state that the orientation of the economies in this direction is to introduce practices within the framework of minimizing the negative effects of natural gas as much as possible. Therefore, we can say that the attempts to reduce the negative effects are in the direction of eliminating the problems related to natural gas. It is possible to deal with the increase in LNG consumption, which is one of the derivatives of natural gas, in this context.

Another option, which has become increasingly important in recent years, but also requires a great deal of dedication in terms of cost, is the transportation of natural gas by liquefaction. The new form that natural gas takes because of cooling and compression processes is expressed as LNG. Liquefied and compressed in terms of

volume, natural gas can be transported as LNG by custom-built ships. This makes it possible to transmit natural gas, like oil, on a global scale by sea. LNG, which has started to gain more importance with the global natural gas demand, has also increased its share in international trade significantly in the last 40 years. The said increase is an average of 15 percent annually. In future projections, it is claimed that the increase in LNG consumption will reach 23 percent by 2050. ("McKinsey Global Gas Outlook To 2050, 2021"). Considering all this, we can say that LNG has become an important component in the global gas industry. The fact that since the first LNG shipment was made in 1959, the volume of tradable natural gas reached 300 billion cubic meters last year is one of the indicators of this. Qatar and Malaysia are the most important exporters in the global LNG trade, while Japan and South Korea are importers.

2.3. General Outlook of Natural Gas and Markets in International Trade

The increasing trend in the global consumption of natural gas and LNG continues continuously. In this context, it is possible to state that these resources, which have become important commodities in the global energy trade, are becoming more and more preferred fuels. Considering its importance and increasing consumption rates, developments within the framework of formations in which natural gas is handled as a commercial commodity are not yet at the expected level. So much so that today, unlike oil, it is not possible to fully talk about the formation of a market that covers the global natural gas trade. Therefore, it is witnessed that the activities within the scope of today's natural gas and LNG trade are carried out through seemingly disjointed formations in which different pricing methods are used. In this direction, first, the methods used for pricing natural gas will be included in the study.

3. PRICING OF NATURAL GAS

Natural gas prices are generally divided into three categories depending on the degree of regulation, market competitiveness and market liquidity; (Melling, 2010:15).

- Government-regulated prices, usually based on the cost of service (long-term contracts),

-Pricing for substitute fuels (commonly known as oil-indexed pricing)

-Spot market pricing in competitive gas markets (competition of gas with gas).

In this context, it is possible to state that the prices of natural gas are not simply determined by the forces of supply and demand (Stern and Imsirovic 2020:7). In other words, methods that may differ from conventional approaches can be used in the pricing process of natural gas. In this respect, we can say that most of the theoretical information in the literature is not at a level to guide researchers. Because most of the theoretical information in the literature is based on the use of natural gas as an important energy source and commercial commodity. Therefore, it is possible to state that several facts beyond theoretical knowledge should be considered when considering the pricing of natural gas. One thing to consider, for example, is that gas pricing is a product of discriminatory monopoly behavior resulting from natural monopoly in many markets where, thanks to their monopoly position, sellers or buyers can segment local and international markets and charge customers different prices (Stern and Imsirovic 2020:7).

Although the first two of the pricing methods are generally considered together, they are natural gas purchase-sale contracts, which are determined by agreements between the parties and where activities are generally carried out within the scope of long-term contracts. In determining the prices in this context, the prices of energy resources, which are alternatives to natural gas, are commonly taken as a reference or indexed to the prices of alternative fuels. The energy source that is taken as a reference or to which prices are indexed is commonly crude oil. In addition, from time to time, it is possible to encounter contracts in which natural gas prices are indexed to petroleum products or taken as a reference. This methodology for pricing natural gas is also known as oil-indexed pricing. The oil-indexed pricing approach is widely adopted in Continental Europe, North Africa, and Asian markets. The duration of long-term contracts, in which the oil-indexed pricing approach is adopted, generally varies between 20-25 years.

Another method is described as the gas-to-gas competition model. At this point, to better understand the method in question, which is associated with the liberalization of natural gas markets, it is necessary to address several concepts first. It is possible to consider the concept of the hub in this context. In this context, it should be underlined that the concept of the hub, which has been witnessed to be widely used for information systems, has become a part of the energy jargon with the developments in the markets. Therefore, in defining the concept of the hub in energy jargon, it is extremely important to name it as the place where a certain activity is defined. The

concept of the hub in energy jargon can be defined as the place where the energy factor is heavily processed physically or virtual. However, the concept in question is a sui generis structure in which its physical and commercial infrastructure is supported and built on basic principles, which expresses a structure different from any formation or platform in many respects. In this context, some requirements become important for the operability of the hub. When we look at world examples, the prominent factor is; For a successful exchange to occur, the legislation that supports the physical and commercial infrastructure together is the necessity of the commercial and the supporting market structure. It is also seen that there are a few activities in the regions or countries that are hubs. These; gas or oil collection and processing, transmission, storage, marketing and trading, distribution retail and value-added services. Whether it is an energy base or an exchange, the commercial purpose of the bases; to provide reference to price formation to support an efficient, transparent, and competitive market (Belet, 2016, ss. 190-198, s. 192).

As a result, we can define the concept of "hub" as market formations where natural gas trade occurs, both raw and converted into LNG form through pipelines, where buyers and sellers come together. The structural and functional characteristics of the mentioned natural gas trade centers vary according to the conditions of the age. In this context, it is possible to consider the physical hubs in the first years of the establishment of natural gas trade centers and the virtual hubs that emerged with the development of technology. To put it more clearly, we can say that natural gas trade centers are structured in two different ways, physical and virtual. For example, Henry Hub, TTF and JKM are internationally referenced entities.

4. METHODOLOGY

The study aimed to investigate the general acceptions in the literature that natural gas markets operate independently of each other. As a matter of fact, these assumptions and claims are mostly based on qualitative methods. In this study, the volatility interaction and transfer between the Henry Hub (HH), Japan Korea Marker (JKM) and Title Transfer Facility (TTF) platforms, which are the pioneers of natural gas trade; The Dynamic Correlation Multivariate Stochastic Volatility (DC-MSV) model was developed by Yu and Meyer (2006).

Stochastic Volatility (SV) models have emerged as an alternative to Autoregressive Conditional Variance (ARCH) models in the analysis of financial time series with characteristic features. Compared to ARCH/GARCH models, these models give more successful results in the case of excessive kurtosis encountered in future forecasts and financial data for the next period (Das et al. 2009: 84). In stochastic volatility models, volatility is modelled as an unobservable, latent variable.

Basic stochastic volatility models were introduced to the literature by Taylor (1986) and Harvey et al. (1994) to a multivariate structure. These models reveal the interdependence of market returns, volatility interactions with each other, and volatility spillovers between markets. The weakness of the basic stochastic volatility models is that the conditional correlation matrix does not have a time-varying structure. As a solution to this problem, the Dynamic Conditional Correlation Stochastic Volatility (DC-MSV) model was developed by Yu and Meyer (2006).

In Multivariate Stochastic Volatility (DC-MSV) models, the time-dependent variation of the correlation coefficient shows a dynamic feature. The DC-MSV model proposed by Yu and Meyer (2006) is as follows:

$$
\begin{aligned}
&r_t = a + \beta r_{t-1} + y_t \\
&y_{A,t} = \exp\left(h_{A,t}/2\right)\varepsilon_{A,t} \\
&y_{B,t} = \exp\left(h_{B,t}/2\right)\varepsilon_{B,t} \\
&p_t = cov(\varepsilon_{A,t}, \varepsilon_{B,t}) = \frac{\exp(q_t) - 1}{\exp(q_t) + 1} \\
&q_{t+1} = \psi_0 + \psi_1(q_t - \psi_0) + \sigma_q v_t \\
&h_{A,t+1} = \mu_A + \phi_A\left(h_{A,t} - \mu_A\right) + \phi_{AB}\left(h_{B,t} - \mu_B\right) + \eta_{A,t} \\
&h_{B,t+1} = \mu_B + \phi_B\left(h_{B,t} - \mu_B\right) + \phi_{BA}\left(h_{A,t} - \mu_A\right) + \eta_{B,t}
\end{aligned}
\qquad (1)
$$

The $r_t = a + \beta r_{t-1} + y_t$ model given in equation 1 above is a first-order vector autoregressive process following the mean model that takes bivariate structure into account. It is defined as $r_t = \left(r_{A,t}, r_{B,t}\right)'$, $y_t = \left(y_{A,t}, y_{B,t}\right)'$. The constant parameters μ_A and μ_B in the volatility model represent the p time-varying dynamic correlation coefficient. $h_{A,t}$, A shows the volatility of the variable A, and $h_{B,t}$ indicate the volatility of the variable B. The

ϕ_A parameter measures the persistence volatility of A, the ϕ_B measures the persistence (consistency) volatility of the B parameter.

The statistical significance of these parameters and the fact that they have values close to 1 indicate that the volatility in the variable has a permanent effect. ϕ_{AB} and ϕ_{BA} indicate the interaction between the volatility of the variables. The statistical significance of the ϕ_{AB} shows that the volatility in the B variable has an effect on the volatility in the A variable; The statistical significance of the ϕ_{BA} indicates that the volatility occurring in variable A has an effect on the volatility occurring in variable B. The parameters $\sigma_{\eta A}^2$ and $\sigma_{\eta B}^2$ which are the variances of the volatility processes in the variables, measure the uncertainty (predictability) of the volatilities in the future periods. There is an asymmetrical relationship between the parameters ϕ_A and $\sigma_{\eta A}^2$ as well as the parameters ϕ_B and $\sigma_{\eta B}^2$. As the volatility persistence parameter (ϕ_A or ϕ_B) for the variable in question approaches (1), the variance ($\sigma_{\eta A}^2$ or $\sigma_{\eta B}^2$) of the volatility process approaches zero. This indicates that the volatility in the variable is predictable.

4.1. Data Set

The variables used in the study are listed in Table 1. These variables consist of monthly data between the period of 01.12.2017-01.12.2021.

Tablo 1. Dataset and Descriptive Concepts

Variable	Variable Description	Period	Source
HH	Henry Hub (HH),	01.12.2017-01.12.2021	Investing.com
JKM	Japan Korea Marker (JKM)		
TTF	Title Transfer Facility (TTF		

4.2. Findings

The return series of the variables used in the study were calculated with the formula $r_t = (\ln {}^{P_t}/_{P_{t-1}})$. The graphs of the return series are presented in Figure 1. In this direciton, the volatility interaction and transfer between the pioneers of natural gas trade, Henry Hub (HH), Japan Korea Marker (JKM) and Title Transfer Facility (TTF); The Dynamic Correlation Multivariate Stochastic Volatility (DC-MSV) model was developed by Yu and Meyer (2006).

The DC-MSV model was used to observe the time-dependent correlation between the returns as well as the volatility interaction of the variables. The Markov Chain Monte Carlo (MCMC) method, which is a Bayesian method, is used for the estimation of DC-MSV models. Unlike other estimation methods, the MCMC method does not require numerical optimization, and this feature is important if the number of parameters to be estimated is high. The MCMC method provides the opportunity to provide latent volatility estimates and distributions of these estimates together with the parameters. This method generates variables from a certain multivariate distribution by repeatedly sampling a Markov chain, whose invariant distribution is the target of the density function of interest (Hepsag, 2013:132).

The analysis of the DC-MSV model was carried out with the WinBUGS 1.4 package program. In the analyzes made with 50,000 samples, 40,000 samples were taken into account by excluding the first 10,000 samples as initial values by the estimation method. Estimation results are given in Tables 2, 3 and 4.

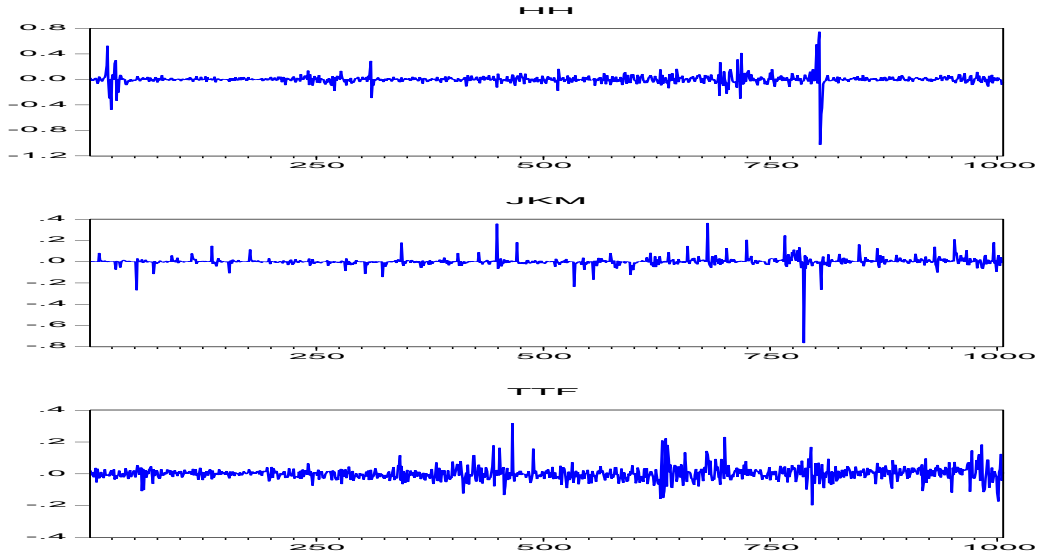

Figure 1. Graphs of Return Series

Table 2. DC-MSV Model Results of HH and TTF

	Medium	**Standard Deviation**	**MC Error**	**Confidence interval (%95)**	
μ_{HH}	-6.623*	0.2764	0.005652	-7.153	-6.046
μ_{TTF}	-6.879*	0.2831	0.008896	-7.378	-6.309
ϕ_{HH}	0.9051*	0.02342	7.66E-04	0.8541	0.9457
ϕ_{HHTTF}	0.07345*	0.02578	7.30E-04	0.02721	0.1282
ϕ_{TTF}	0.9605*	0.01578	5.51E-04	0.9253	0.9869
ϕ_{TTFHH}	0.001859	0.01058	2.84E-04	-0.01776	0.02381
$\sigma_{\eta HH}$	0.5123	0.05972	0.00235	0.4068	0.6372
$\sigma_{\eta TTF}$	0.2867	0.04265	0.002018	0.2023	0.3729
ψ_0	0.105	0.2206	0.01218	-0.08553	0.662
ψ_1	0.8599*	0.09903	0.005367	0.6234	0.9807

*: Statistically significant at the 5% level.

According to the DC-MSV model results of Henry Hub (HH) and Title Transfer Facility (TTF) returns given in Table 2, the ϕ_{HH} parameter, which expresses the Henry Hub index return's own volatility, is statistically significant at the 5% level. The fact that this parameter is close to 1 with a value of 0.9051 indicates that there are intense volatility clusters in the Henry Hub index and that volatility is permanent. A volatility shock in the Henry Hub index has a continuing effect on its volatility. The ϕ_{TTF} parameter, which expresses the volatility of the Title Transfer Facility index return, is statistically significant at the 5% significance level. The parameter close to 1 with a value of 0.9605 indicates volatility clustering.

ϕ_{HHTTF} parameter, which shows the existence of interaction from TTF index volatility to HH index volatility, is statistically significant. Accordingly, there is a direct transfer from the TTF index volatility to the HH index volatility, and the 1% shock that increases the volatility in the TTF index increases the HH index volatility by 0.07%. from the other hand, the ϕ_{TTFHH} parameter, which shows the existence of an interaction from HH index volatility to TTF index volatility, is statistically insignificant.

The fact that the ϕ_{HH} and ϕ_{TTF} take values close to 1 and the $\sigma^2_{\eta HH}$ and $\sigma^2_{\eta TTF}$ take values close to zero indicates that the volatility in both indices is predictable. However, the statistical significance of the ψ_1 parameter shows a dynamic feature that changes over time. Based on the dynamic correlation coefficient obtained as 0.8599, there is a positive and strong relationship between the variables.

Table 3. DC-MSV Model Results of JKM and HH

	Medium	Standard Deviation	MC Error	Confidence interval (%95)	
μ_{JKM}	-8.807*	0.1819	0.001485	-9.168	-8.448
μ_{HH}	-6.685*	0.2513	0.002501	-7.182	-6.187
ϕ_{JKM}	0.5245*	0.05156	8.18E-04	0.4191	0.6209
ϕ_{JKMHH}	0.2184*	0.06293	0.00103	0.09955	0.3465
ϕ_{HH}	0.9347*	0.01878	5.46E-04	0.8943	0.968
ϕ_{HHJKM}	0.001582	0.01427	3.27E-04	-0.02569	0.03027
$\sigma_{\eta JKM}$	1.847	0.09439	0.001586	1.667	2.035
$\sigma_{\eta HH}$	0.4809	0.05224	0.002017	0.3861	0.5901
ψ_0	0.05171	0.1052	0.003704	-0.1637	0.2532
ψ_1	0.9497*	0.0271	0.001399	0.8776	0.9828

*: Statistically significant at the 5% level.

According to the DC-MSV model results of Japan Korea Marker (JKM) and Henry Hub (HH) returns, the ϕ_{JKM}, which expresses the volatility of the Japan Korea Marker (JKM) index return, is statistically significant at the 5% level. The fact that this parameter is not close to 1 with a value of 0.5245 indicates that there is no intense volatility clustering in the JKM index and that volatility is not permanent. The ϕ_{HH} parameter, which expresses the volatility of the Henry Hub index return, is statistically significant at the 5% significance level. A parameter close to 1 with a value of 0.9347 indicates that there is volatility clustering and that a volatility shock in the Henry Hub index has a continuous effect on its volatility.

ϕ_{JKMHH} is statistically significant. Accordingly, there is a direct transfer from the TTF index volatility to the HH index volatility, and the 1% shock that increases the volatility in the HH index increases the JKM index volatility by 0.21%. The ϕ_{HHJKM} parameter, which shows the existence of an interaction from JKM index volatility to HH index volatility, is statistically insignificant.

The fact that the ϕ_{JKM} does not take a value close to 1 and the $\sigma^2_{\eta JKM}$ parameter takes a value far from zero indicates that the volatility in the JKM index is not predictable. However, since the ϕ_{HH} has a value close to 1 and the $\sigma^2_{\eta HH}$ parameter has a value close to zero, it has been determined that the volatility in the HH index is predictable. However, the statistical significance of the ψ_1 parameter shows a dynamic feature that changes over time. Based on the dynamic correlation coefficient obtained as 0.9497, there is a positive and strong relationship between the variables.

Table 4. DC-MSV Model Results of TTF and JKM

	Medium	Standard Deviation	MC Error	Confidence interval (%95)	
μ_{TTF}	-6.944*	0.2613	0.006499	-7.458	-6.406
μ_{JKM}	-8.686*	0.2481	0.004028	-9.194	-8.202
ϕ_{TTF}	0.9608*	0.01646	5.52E-04	0.9248	0.9891
ϕ_{TTFJKM}	0.002974	0.01167	3.77E-04	-0.01915	0.0265
ϕ_{JKM}	0.4938*	0.05532	0.001177	0.3816	0.5972
ϕ_{JKMTTF}	0.4352*	0.09295	0.002456	0.2619	0.6272
$\sigma_{\eta TTF}$	0.2767	0.04056	0.001909	0.1996	0.3584
$\sigma_{\eta JKM}$	1.693	0.08503	0.001563	1.531	1.865
ψ_0	0.1954*	0.08862	0.004491	0.04356	0.3602
ψ_1	0.8435*	0.1204	0.006561	0.5273	0.9694

*: Statistically significant at the 5% level.

According to Table 4, the ϕ_{TTF} parameter, which expresses the volatility of the Transfer Facility (TTF) index return, is statistically significant at the 5% level. The fact that this parameter is close to 1 with a value of 0.9608

indicates that there is an intense volatility clustering in the TTF index and that volatility is permanent. Accordingly, a volatility shock occurring in the TTF index has a continuous effect on its volatility. The ϕ_{JKM} parameter, which expresses the volatility of the Japan Korea Marker (JKM) index return, is statistically significant at the 5% significance level. However, the fact that the parameter is far from 1 with a value of 0.4938 indicates that there is no volatility clustering.

The parameter ϕ_{TTFJKM}, which shows the existence of interaction from JKM index volatility to TTF index volatility, is statistically insignificant. The ϕ_{JKMTTF} parameter, which shows the existence of an interaction from TTF index volatility to JKM index volatility, is statistically significant at the 5% level. Accordingly, there is a direct transfer from the TTF index volatility to the JKM index volatility, and the 1% shock that increases the volatility in the TTF index increases the JKM index volatility by 0.43%.

The fact that the ϕ_{TTF} TTF parameter takes a value close to 1 and the $\sigma^2_{\eta TTF}$ parameter has a value close to zero shows that the volatility in the TTF index is predictable. However, since the ϕ_{JKM} parameter is far from 1 and the $\sigma^2_{\eta JKM}$ parameter is far from zero, it can be said that the volatility in the JKM index is unpredictable. However, the statistical significance of ψ_0 and ψ_1 parameters shows a dynamic feature that changes over time. Based on the obtained dynamic correlation coefficient, there is a positive and strong relationship between the variables.

The fact that the ϕ_{TTF} takes a value close to 1 and the $\sigma^2_{\eta TTF}$ has a value close to zero indicates that the volatility in the TTF index is predictable. However, since the ϕ_{JKM} is far from 1 and the $\sigma^2_{\eta JKM}$ is far from zero, it is possible to interpret that the volatility in the JKM index is unpredictable. However, the statistical significance of the ψ_0 and ψ_1 shows a dynamic feature that changes over time. Based on the obtained dynamic correlation coefficient, there is a positive and strong relationship between the variables.

5.CONCLUSION

Global consumption of natural gas and LNG is increasing day by day. Related to this natural gas markets have become more important. But, when compared to oil, it is extremely difficult to talk about the existence of a fully developed market mechanism for natural gas. However, the expression in question does not mean the absence of market mechanisms through which the commercial activities of natural gas are carried out. Therefore, it should be considered that there is not yet a global market structure for natural gas compared to oil.

Nowadays, it is witnessed that the natural gas trade is carried out through mechanisms that seem to be disconnected from each other. In this context, benchmark structures play an important role in relation to hub formations and pricing. While these hub formations play an important role in the functioning of natural gas markets as physical and virtual trade centers, benchmark formations come into play at the pricing stage. In the light of all these, it is possible to state that the natural gas trade in the world is shaped within the framework of hubs or benchmark formations divided into three disconnected regions. North America, Europe and Asia are the regions in question.

We can claim that it is extremely difficult not to be affected by these disjointed regions in today's conditions. So much so that in the trade of strategic energy resources such as natural gas, although it may seem disconnected in the era of globalization, it does not seem rational that the development in any part of the world triggers the dynamics in another market. To understand this situation more clearly, price movements in European markets should be considered together with those in other markets.

AUTHORS' DECLARATION

This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support.

AUTHORS' CONTRIBUTIONS

Conceptualization, writing-original draft, data collection, editing – AÇE, methodology, formal analysis – EBE, Final Approval and Accountability – SG

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International Journal of Business & Economic Studies
Year: 2022, Vol: 4, No:1, pp.11-25
https://doi.org/10.54821/uiecd.1094499

Effect of Financial Sector Development on Monetary Stability Objective in CEMAC

CEMAC'ta Finansal Sektör Gelişiminin Parasal İstikrar Hedefine Etkisi

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Received : 28.03.2022
Revised : 14.06.2022
Accepted : 27.06.2022
Type of Article : Research

Keywords:

Financial sector development,

Monetary stability,

Inflation,

CEMAC

Jel Codes:
E02, E52, F45

ABSTRACT

The paper determines the role played by banking stabilization policies over the relationship between financial sector development and monetary stability objective. Applying generalised method of the moments (GMM) system of Blundell and Bond (1998) over the inflation equation constructed by Gallic and al (2017), we found that undesirable effects of financial sector development (credit risk) increase inflation rate in CEMAC. Besides, the negative relationship between financial sector development and monetary stability objective quoted in the literature is not reversed in CEMAC. The credit risks, the main cause of monetary instability and the main undesirable effects of financial sector development increase the inflation rate in CEMAC. Therefore, policymakers need to curb any increased of credit risks associated with financial sector development as this risk increase inflation in CEMAC.

Anahtar Kelimeler:

Finansal Sektör Gelişimi,

Parasal İstikrar,

Enflasyon,

CEMAC

Jel Kodları:
E02, E52, F45

ÖZET

Araştırma, finansal sektör gelişimi ile parasal istikrar hedefi arasındaki ilişki üzerinde bankacılık istikrar politikalarının oynadığı rolü belirlemektedir. Gallic ve diğerleri (2017) tarafından oluşturulan enflasyon denklemi üzerinde Blundell ve Bond'un (1998) genelleştirilmiş momentler (GMM) sistemini uygulandığı araştırmada finansal sektör gelişiminin (kredi riski) istenmeyen etkilerinin CEMAC'ta enflasyon oranını artırdığını bulunmuştur. Bunun yanı sıra, literatürde alıntılanan finansal sektör gelişimi ile parasal istikrar hedefi arasındaki negatif ilişki CEMAC'ta tersine çevrilmemiştir. Parasal istikrarsızlığın temel nedeni olan kredi riskleri ve finansal sektör gelişiminin başlıca istenmeyen etkileri CEMAC'ta enflasyon oranını yükseltmektedir. Bu nedenle, CEMAC'ta bu risk enflasyonu artırdığından, politika yapıcıların finansal sektör gelişimiyle ilişkili artan kredi risklerini engellemeleri gerekmektedir.

Citation: Mbanga Pagal, E. D. (2022). Effect of Financial sector development on monetary stability objective in CEMAC. *International Journal of Business and Economic Studies*, 4(1), 11-25, Doi: https://doi.org/10.54821/uiecd.1094499

1. INTRODUCTION

Determine the nature of the link between financial sector development and monetary stability has been subject to many studies. The reason of this interest derives from the fact that, during the process of the financial sector development, changes are observed in the sector and outbreak stability (Korinek and Sandri, 2015) especially monetary stability (Scialom, 2013). The source of this instability is clear for Almarzoqi et al (2015), the combination of the increasing volume of liquidity, diversification of the range of financial services and the increase of actors involved in the financial activities change the environment. Thus changes increase therefore instability because of the changing behaviour of financial actors towards liquidity (Scialom, 2013).

After the 2007-2008 crises, the echo of economic news suggested the consolidation of financial stabilisation policies, specifically those directed at the banking sector as an approach to contain the negative effect of financial development. The main motivation behind this choice is that tools provided by this prudential policy can play an important role to reduce perverse choices of financial actors toward liquidity (Boissay et al, 2021) as, the connection and permeability between different actors in the financial sector inhibit central bank from anticipating deviant choices that are a source of risk and monetary instability (Gaffard and Napoletano, 2018).

The need to provide stability by controlling actors of the financial system who have the capacity to create money can reduce any risk associated with this capacity to create money that the monetary stability objective has been hard to contain. In fact, monetary stability has been targeted to reduce price fluctuation and contain some negative effects of perverse choices adopted by financial actors producing instability toward liquidity (Scialom, 2013). Whether independent or not, monetary stability is the priority policy objective sought by all central banks (Bikai and Essiane, 2017; Nyanda, 2021). Central banks generally confine this monetary stability objective to the control of price fluctuations (Aglietta and Scialom, 2009).

For Issing (2003), monetary stability is all about price stability or inflation target, conditions the behaviour of financial intermediaries. Minegishi and Cournède (2010) explain that in spite of being straightforward to condition behaviour toward liquidity, this objective allows the central bank to anticipate risk attached to financial sector development for example credit volatility. The recent financial crises beyond their intensity have unfortunately shown the weakness of the monetary stability objective. Thus, the financial system experience has also shown that the relationship between financial sector development and monetary stability is not so easy.

This paper wants to measure the improvement of the relationship between financial sector development and monetary stability in CEMAC produced by the banking sector stabilisation policy. The case of the CEMAC sub-region receives particular attention for the simple reason that, in the first Article of its statutes, the central bank of this sub-region has included the promotion of financial stability as one of its main tasks. The study will help to highlighted factors hindering monetary stability objective from two aspects (determinants of monetary instability and influence of the undesirable effects of financial sector development). The credit risks consider as the main cause of monetary instability and the main undesirable effects of financial sector development in CEMAC, it is needed to explain how it increase the inflation rate. The result will provide insight to policymakers as they need to curb any increased of credit risks associated with financial sector development as this risk increase inflation in CEMAC.

The reminder of the article is as follows: the next section proposes a brief overview of financial sector development indicators in CEMAC and their implications for risk and inflation. Section 3 provides a literature review link between financial sector development and monetary stability objective considering the role of stabilisation policies and their implications in this relationship. Section 4 describes data and econometric methodology. Section 5 report results making suggestions and the last section concluded.

2. OVERVIEW of FINANCIAL SECTOR DEVELOPMENT in CEMAC and IMPLICATIONS for STABILITY

The development of the financial sector in CEMAC has been consolidated in the years following the liberalisation policies of the 1990s. This development marked by changes both in the formulation of intermediation activity, organisation of the financial sector and organisation of monetary policy instruments made it possible to regulate

the banking profession and restored the image of banks in the minds of the population. The main objective of the monetary policy actor, the Bank of Central African States (BEAC) is to ensure monetary stability[1].

This main objective is defined into two sub-objectives: internal stability (low inflation) and external stability (sufficient external coverage of the currency). BEAC's statutes also allow the central bank, without prejudice to its monetary stability objective, to support economic policies developed by the States. BEAC's monetary policy aims to maintain monetary stability and support the general economic policies of the States. To achieve its objectives, the BEAC uses several instruments, including (i) refinancing policy through the manipulation of interest rates and the setting of refinancing ceilings per State (ii) mandatory reserves policy.

The central bank of the CEMAC subs region uses two main tools (i) Interest Rate on Tenders (TIAO) and (ii) reserve ratios, it acts through this by refinancing quantities ceiling per country. In addition, measures taken by the Monetary Policy Committee since the mid-2000s show that the BEAC's monetary policy is accommodating because it works to facilitate the financing of economies. This central bank seems to be more concerned with the stability of its payment system and its banking sector stability.

The increasing number of financial institutions[2] followed with mix types of finance bank finance, market finance and informal finance confronted the necessity for the BEAC to know whether its action affects its main variables namely: inflation, foreign exchange reserves (rank with the currency's external cover ratio), and activity (rank with the Gross Domestic Product). The increases in financial intermediaries and mixed types of finance hosts in the financial system have driven an important role in the financial sector development in CEMAC. The expansion of liquidity flows and volume of credit in CEMAC countries confirm the positive impact of the previous financial sector policies (liberalisation policies of the 1990s). The volume of liquidity is located around 16% of GDP, and the credit share to the private sector around 10% of GDP moves closer to 25% of GDP and 20% of GDP respectively in CEMAC. While this level of credit remained under the 35% GDP observed in sub-Saharan African countries, this moderate improvement has been accompanied by undesirable effects (Onomo[3], 2021). During 2000-2018 three (03) main trends are observed. Over 2000-2005, the moderate pace is observed.

The diminution of those financial sector development indicators during 2006-2012 has moderated the level of the unintended effect of financial sector development. The last period 2013-2018 is marked by the easing his interest rates, promotion of medium-term loans, the halving of mandatory reserve ratios, widening refinancing conditions for banks finally can explain the improvement of liquidity flows extending to the expansion of credit in CEMAC (see figure 1).

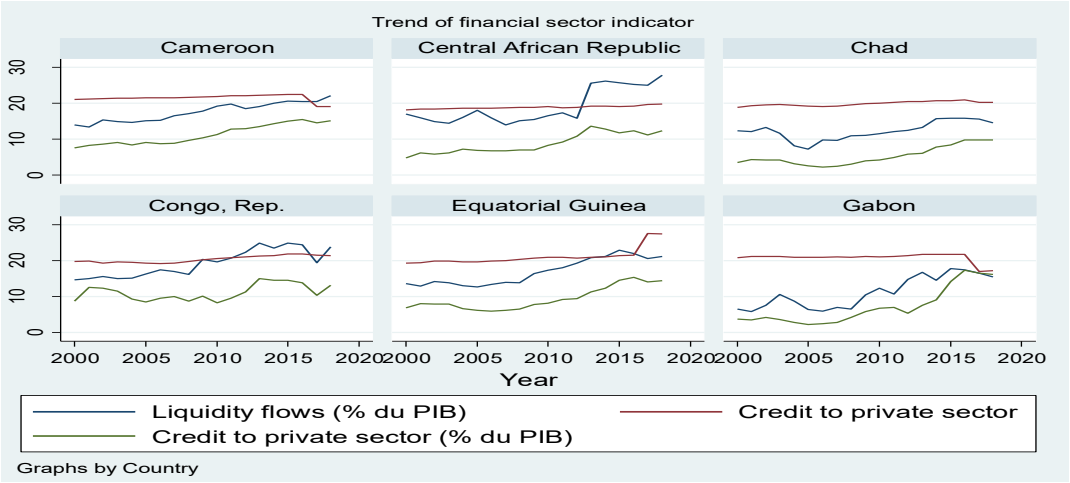

Figure 1. Trend of Financial Development Indicator in CEMAC
Source: constructed by authors under Stata 14.2 with WDI 2021 database.

[1] The selected community standard adopted for multilateral surveillance is 3% of inflation this is the target for internal monetary stability. The external coverage ratio is the ratio of the central bank's external assets to its liabilities to the banking sector and governments. To preserve this external monetary stability, the BEAC also adopted in 2017 a reserve target equivalent to three months of imports and short-term public debt coverage.

[2] Today, the range of financial institutions instead of 30 financial institutions (only commercials banks meet in the 1990s) financial institutions is nearly1000 institution. It is made up of banks (54 commercial banks), financial institutions (11 credit institutions), microfinance institutions (790), insurance companies (58) and social security institutions (8). These financial institutions are supplemented by a market infrastructure that includes a bond market and an equity market.

[3] Financial Analyst at the Directorate of Studies, Research and Statistics - BEAC, comment extracted from the Research Letter of the Central Bank of African States n°10 1st semester 2021, Pp 11-13 "Non-performing loans, indicators of financial stability in the CEMAC zone

Following Fofack (2005) this increase in liquidity flows and credit supply went along with a reduction in the quality of the asset. These undesirable effects lay hold to an increase in non-performing loans (see Figure 2). This source of monetary instability associated with the high level of risk entered reduces automatically the expected gains of financial sector development in CEMAC. Fofack (2005) argues that the level of credit risk related to the development of the financial sector rises above what was observed at the height of the Asian crisis (25% of non-performing loans) the progression of this risk grown above 30% in the CEMAC.

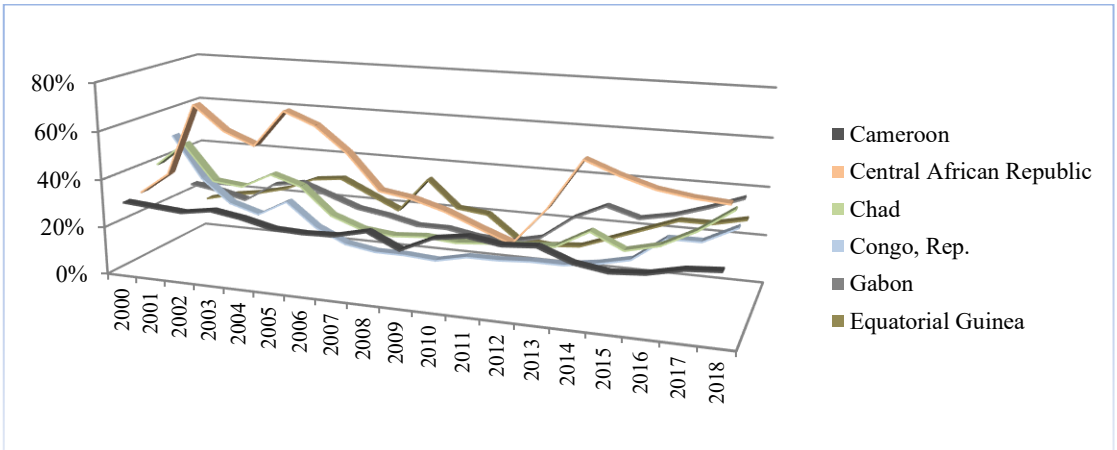

Figure 2. Trend of Non-performing Loans

Source: constructed by authors with BEAC 2021 database.

The batch reading of figures 1 and 2 disclose three (03) main trends of the negative effects of financial sector development. From 2000 to 2005 marked by a moderate increase in credit growth, during this period low level of 15.7% instability is observed over the sub-region. The decline in credit supply during the period 2006-2012, was followed by a downward trend in the level of credit risk standing around 13.8% over the sub-region. The level of risk remained significant. The increase in credit over the period 2013-2018 went along with an increase in credit risk as to the level of non-performing loans reached on average 32% in CEMAC (see Figure 2).

Even though a direct link has never been established between those consequences of financial sector development and monetary stability in CEMAC, observing the trend of inflation (see figure 3) shows how the financial sector development has affected the central banker's objective of internal monetary stability. While the impact is not homogeneous within the countries, Cameroon with its sustained financial sector development put forward low variability inflation. Apart from this country, the rest of the CEMAC countries confirm that an increase in credit volume and liquidity flow breeding an increase in credit risk impact the internal monetary stability objective.

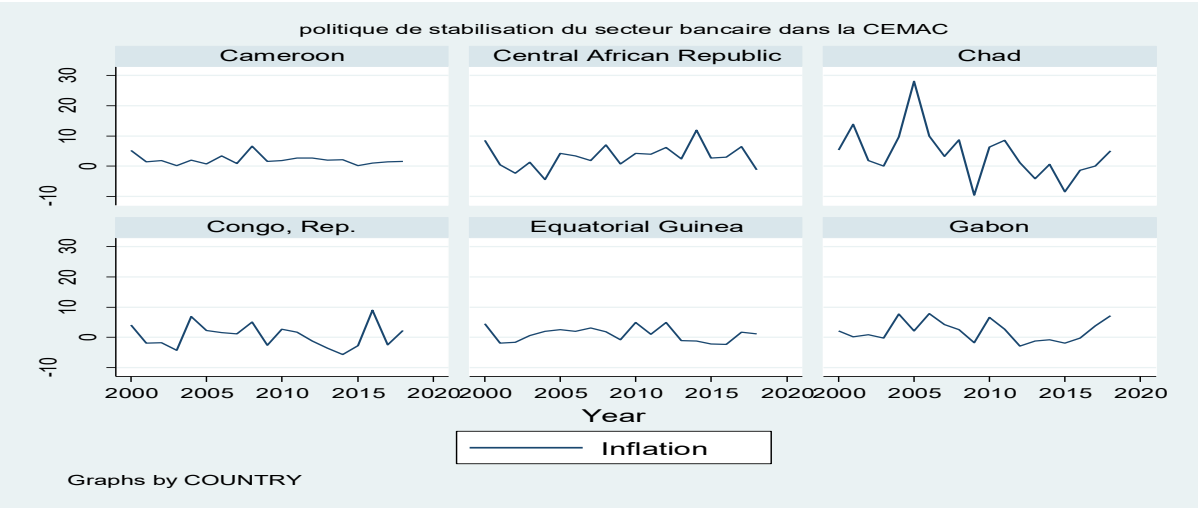

Figure 3. Trend of Inflation by Country

Source: Authors own construction under Stata 14.2 with BEAC 2021 dataset

Even if, the visual examination of the different figures (1, 2 and 3) remains weak to justify the existence of a causal relationship between the negative effect of financial sector development and inflation, at least those figures show that an increase in financial sector development indicators in the CEMAC is correlated with the variability inflation and increase of credit risk. This figure suggests it is essential to examine the impact of financial sector development on the monetary stability objective at least as the risk attached to financial sector development in CEMAC can affect the objectives of the central banker, especially inflation.

3. LITERATUR REVIEW

In the financial sector, only two actors have the capacity to condition behaviour toward liquidity: commercial bank and central bank. The easiest explanation is that those financial actors have the ability to change the volume of liquidity in circulation through their capacity to create money (Scialom, 2013). Despite the fact that the central bank remains the money-issuing institution, this actor is subordinate to the commercial banks in this money creation from a quantitative point of view (Scialom, 2013). Scialom statement implies that the money issued by commercial banks dominates in quantity the one issued by central banks. However, it stands to be the main cause of monetary instability (Spyromitros ve Tsintzos, 2019).

Facing the question of how financial sector development affects monetary stability huge work pay attention to the literature to answer this question. While some works examine the link between financial sector development and monetary stability, other works try to determine the factors involved affecting this relationship. For the first strand of this literature, Rousseau and Wachtel (2002) are the first to detect an inverse relationship between financial sector development and monetary stability. Authors tried to understand why inflation negatively affects the development of the financial sector. According to them, price variability is associated with high inflation rates and this high level of inflation has a negative effect on financial depth.

While their comments do not say whether the development of the financial system restricts the action of the central banker, Ganley (2004) does not answer the question but establishes a positive relationship between excess liquidity and inefficiency of the central banker's action. For Ganley (2004), financial sector development leads to a reduction in the potential influence of the central bank by weakening: (i) the instruments of monetary policy (ii) intervention in the money market and (iii) control of balance sheet and income of banks. This Ganley statement suggests that instruments used by the central banker to achieve its monetary policy and reached its monetary stability objective can be inoperative because of the excess liquidity observed as a result of the evolution of financial intermediation activity.

For Driscoll (2004) unintended factors are the origin of this negative relationship. Ganley (2004) may be the one opening a door to the set-up of those unintended factors that affect the relationship between financial sector development and monetary stability. Two approaches facilitate this examination, the microeconomic view and the macroeconomic view. While the second strand finds that risk management is the appropriate way to combat the undesired effects of financial sector development, the first strand states that the explanatory factors of this instability are always faced during the phases of financial sector development.

The microeconomic view has been interested in the questioning process of resource allocation and banking crises (Barth et al. 2004; Driscoll, 2004; Nyborg, 2016). The macroeconomic view has focused on volatility issues and risk management (Minsky, 1986; Kindleberger, 2000; Bernanke, 2009; Rajan, 2009; Altunbas, 2010 and 2012; Boissay et al, 2021). Over the recent decade's macroeconomic views have been more developed in literature than the microeconomic view. For this second strand, the main challenge is to propose strategies that may increase the central banker's room of action and thereby act to preserve its monetary stability objective, absorb all range of risk (Criste and Lupu, 2014). This approach appears an appropriate way of fighting the undesirable effects of financial sector development namely monetary instability, management risk, operational risk, credit risk and above all this challenges systemic risk (Bech et al, 2014).

The empirical studies working to shape the link between financial sector development and inflation are opened up by Rousseau and Wachtel (2002) studies. Rousseau and Wachtel (2002) choose the rolling regression technique over 84 countries to analyse interactions between inflation and financial depth, thus their incidence over economic growth. Their results suggest that, when inflation falls below the threshold of 6% to 8%, financial depth affect positively economic growth. However, when inflation is around 15% to 20%, financial depth does increase growth, they conclude expressly that inflation has a negative effect on financial sector development. Batayneh et al (2021), Effiong (2020), Kim et al (2010), even Keho (2009) expand this analysis. If Batayneh et al (2021) and Kim et al (2010) have in common their approach, while the first author focuses on the case of Jordan country, the

second construct a panel of 87 countries. Batayneh et al (2021) study the relationship over the period 1993-to 2018 while Kim et al (2010) study the same relationship over the period 1960–2005.

The Autoregressive distributed lag model (ARDL) gave to authors the advantage of differentiating long-run effects from short-run effects. Opposed to Batayneh et al (2021) who found a negative and significant impact of price stability on financial sector development in the short and long run, Kim et al (2010) find a differentiated impact over time. Kim et al (2010) state that in the short run, the relationship between financial sector development and inflation is positive and insignificant. It becomes negative but significant in the long run. The other group of authors focused on African countries' cases. Keho (2009) uses time-series data techniques and examines the causal relationship between inflation and financial sector development in the long run. The cointegration test proposed by Pesaran et al (2001) and the Granger causality test suggested by Toda and Yamamoto (1995) the author uses allow him to control the type of causality. The study is made up of a sample of WAEMU countries. Keho (2009) finds that in six countries in his sample, no evidence of the long-run relationship between inflation and financial sector development exists. The two countries' results provide a lack of causality between inflation and financial sector development. Further, the evidence of reverse causality in two countries of his sample allowed him to say that financial sector development affects monetary stability objectives differently in WAEMU countries.

Effiong et al (2020) use different techniques from that of Keho (2009) and the focus of their study is quite different from the one proposed by the other authors. Effiong et al (2020) using Generalized Method Moment –GMM in the system, analyse the influence of financial sector development on the effectiveness of the monetary policy. Over the period 1990-to 2015, his sample is made up of 39 African countries. The main advantage quoted by Effiong et al (2020) in regard to the relevance of its chosen approach is the ability to easily detect direct effects in the relationship. However, like previous authors, Effiong et al (2020) find a negative relationship between financial sector development and monetary stability objective.

As Keho findings expose the existence of varied results and causality patterns across countries, especially among countries members of the same sub-region or monetary union, the additional range of empirical studies extended this analysis to expand central bankers' room for manoeuvre. The concern for those authors is not the negative link between inflation and financial sector developments is more the need to fulfil central banker objectives and contain undesirable effects of financial sector development.

Boissay et al (2021) have recourse to the Dynamic Stochastic General Equilibrium (DSGE) to explain how undesirable effects of financial sector development can be contained. The sample used by the authors is made up of European Union countries and the United States. Running their studies over the period 2003-2013, enabling them to argue that fragility of the financial sector occurs when the central bank commits itself to a backstop economy.

For Boissay et al (2021), following the strict inflation target does enable the central bank to reduce the probability of risk attached to financial sector development. Moreover, the authors discover that the trade-off between price stability and financial stability is starker when the central bank responds mildly to its monetary stability objective. Boissay et al (2021) do not only expose a trade-off between monetary stability objective and financial stability, authors show how the central bank can forestall risk attached to financial sector development.

Ngouabi (2021) in the same vein work on the case of CEMAC countries and use the Generalized Method of Moments-GMM in the first difference. The author treated the problem differently. Instead of directly introducing the instruments of the banking sector stabilisation Ngouabi (2021) constructs a policy mix frame between monetary policy objective and financial sector stabilisation policy. Focus on inflation targeting perspective Ngouabi (2021) finds that it is difficult for the central banker to mix both prudential and monetary policy. Ngouabi (2021) found a trade-off between financial stability and monetary stability objectives. He concludes that central bankers cannot follow the objective of monetary stability and the objective of financial stability.

Creel et al's (2013 and 2015) work seems to be the main attempt to analyse this relationship. In fact, those authors have been more interested in raising the contribution of banking sector stabilisation policy (prudential tool) in the relationship between financial sector development and monetary stability objective. Using a similar technique to that of Ngouabi (2021), the Generalized Method of Moments-GMM in the first difference, Creel et al (2015) work over the period 1996- 2011 for the case of European Union countries analysing the link between the financial sector development and monetary stability objective. Creel et al (2015) detect that banking sector stabilisation policy goes along with the fulfilment of monetary stability objective.

Accordingly, the authors explain that these banking stabilisation instruments reduce the asymmetry problem main source of the negative link. Furthermore, Creel et al (2015) state that stabilisation instruments assist monetary policy instruments because they limit the deviation of financial intermediaries and the other actor in the financial sector. In spite of the absence, a clear theoretical model where the monetary stability objective interacts with prudential tools as Boissay et al (2021) or Ngouabi (2021) frame the relation in their studies, Creel et al (2015) exploit Beck (2004) equation and directly rely on prudential tools to inflation. Facing this main limit of Creel et al (2015) this contribution is an open door to frame the contribution of stabilisation policies.

4. THE EMPIRICAL FRAMEWORK

The empirical framework is made up of three axes. The first axis concerns the theoretical model. The second axis concerns the econometric methodology, and the last axis concerns the data.

4.1. Theoretical Model

Following Gallic et al (2017) central bank function, monetary stability exposes the objective function followed by the central banker. This function is written as follows:

$$P_t = E[\lambda(\pi_t - \pi_t^*)^2 + (1-\lambda)(y_t - y_t^*)^2] \quad (1)$$

Gallic et al. (2017) suggest to the central banker consider all the exogenous movements (shocks) that influence his objective function.

In this vein, Effiong et al, (2020) explain that changes in the financial system are not an exogenous movement for the monetary policy but can be caused by exogenous movements. Therefore, central bankers must consider the impact of different shocks (Effiong et al, 2020). For Gallic et al, (2017) including supply and demand shocks[4] in their performance function are the right direction for the central banker as these are the main phenomena influencing his action. Effects of supply (equation 2) and demand (equation 3) shocks reducing central banker action can be written in the following form:

$$\pi_t - \pi_t^* = -1/\varphi\,(y_t - y_t^*) - \theta\varepsilon^s \quad (2)$$

$$\pi_t - \pi_t^* = -\omega(y_t - y_t^*) - \delta\left(r - \varepsilon^d\right) \quad (3)$$

Parameters $\boldsymbol{\pi_t}$ and $\boldsymbol{y_t}$ in the different equations (1, 2, 3) refer to the inflation rate and growth rate respectively and parameters $\boldsymbol{\pi_t^*}$ and $\boldsymbol{y_t^*}$ refer to the target. The parameters λ and 1-λ measure respectively the degree of reaction of monetary policy to the variation of the inflation rate and the degree of reaction of this policy to the variation of growth rate. And parameter r provides information on the interest rate policy; ω and φ are structural coefficients that also act as slope coefficients; ε^s and ε^d refer respectively to supply and demand shocks respectively.

The central bank money is stable that is not the case for the commercial bank (Scialom, 2013; Mishkin, 2010). Through the creation of deposits (components of money), commercial banks increase their intervention in the money creation chain is very common after a demand shock (Gallic et al, 2017). Those commercial banks change their balance sheet's structure (Nyborg, 2016 and 2017), their ability to lend more credit to firms and households without pre-existing resources modify the central banker's equilibrium (Effiong et al, 2020).

Despite the use of different reference models, Effiong et al, (2020) employ Karras (1999) model while Gallic (2017) work with Cecchetti and Krause (2001) model, Effiong et al, (2020) one paraphrasing of demand shocks shows how this shock affects policy rule (r). The incidence of a demand shock on policy rules can be written as follows:

$$\pi_t - \pi_t^* = -\omega y_t + \omega y_t^* - \delta r + \delta\varepsilon^d \quad (4)$$

[4] For Gallic et al (2017) those shocks are Auto-regressive process of order 1, $\boldsymbol{\theta^S}$ **and** $\boldsymbol{\theta^D}$ terms are between 0 and 1

The equilibrium pursued by the central banker is contained in is policy rule (Cecchetti, 2001; Cecchetti and Kraus, 2001); Gallic (2017) illustrates as follows:

$$\mathrm{r} = \mathrm{r}^* + a\varepsilon^d + b\varepsilon^s \quad (5)$$

The r* refers to the Taylor standard rule written as follows:

$$r^* = i^* + \mathrm{a}\acute{\pi}^* + \mathrm{b}\acute{y}^* \quad (6)$$

The introduction of the Taylor rule standard (equation 6) in Gallic et al (2017) monetary policy rule (equation 5) produces this monetary policy response facing changing environment.

$$\mathrm{r} = i^* + \mathrm{a}\acute{\pi}^* + \mathrm{b}\acute{y}^* + a\varepsilon^d + b\varepsilon^s \quad (7)$$

In quite simplified form, this relationship shows the complex problem that the central banker faces constantly. The fact is that the issue for the monetary policy authority is to shift its interest rate (downwards or upwards) while keeping up its desired equilibrium (inflation target and stability of economic activity). Cecchetti (2001) indicates that the central banker has two alternatives to improve his manoeuvre room: an alternative targeting rule or a targeting rule vs an instrument rule. Cecchetti and Kraus (2001), even Krause and Roja (2006) following Cecchetti (2001) explain that it seems to be the way for the monetary policy authority to limit incentives for excessive risk-taking observed during the financial sector development.

The first option, the alternative targeting rule is a purely technical option (Cecchetti, 2001). The option implies that the central banker preserves his objective of monetary stability by assuming an expected inflation path as close as possible to the target level; unfortunately, the realisation of this decision is unlikely (Cecchetti, 2001). Moreover, as it is difficult for him to reach the target, controlling liquidity flow (monetary base or monetary aggregates) which are neither a direct target nor an instrument does not guarantee any ability to absorb the effects of changes (Mishkin, 2009). The central bank has to turn to the second option, this second option, targeting rule vs instrument rule opposed in particular target to an instrument rule.

It's not a policy in itself (Cecchetti, 2001), however undesirable effect of changes in monetary policy rules is certainly contained through this option (Cecchetti and Kraus, 2001; Krause and Roja, 2006). In practice, the targeting rule allows the head of monetary policy to adjust its instruments to follow the path to its target (Cecchetti, 2001) while the instrument rule defines how the interest rate should be raised or lowered (i.e. how the central banker can raise or lower its interest rate (in a certain amount) to offset shock (in demand or supply-side)). Therefore, the monetary policy reaction $\boldsymbol{\delta r}$ to demand shock can be done in the following way:

$$\varphi r = \vartheta_0 - \vartheta_1 m \quad (8)$$

The $\boldsymbol{\vartheta_0}$ **the** precise simplified form of the complex problem faced by central bankers (equation 7); the term $\boldsymbol{m}$ rank spillover effects of changes especially those caused by the financial sector development. At this level, Rieu-Foucault's (2018) comment relating prudential tools as the increased room for manoeuvre offered to the central bankers makes an increased capacity for central bankers to contain these spillover effects. This suggestion intuitively assumes that in equation **8**, the prudential tools can be introduced as follows:

$$\varphi r = \vartheta_0 - \vartheta_1 m - isf \quad (9)$$

The term reflects the backup brought by prudential policy (the solvability of banks and the liquidity of banks). The incentive to take this stabilisation policy or regulation of the banking sector is looking toward limiting spillover effects of financial development (credit risk and market risk). This article restricted its analysis to credit risk (see Figure 2). This choice is due to the fact that in the CEMAC sub-region the financial market is not well developed. Compilation of equations 7 and 9 into equation 4 gives the reference equation written as follows:

$$\pi_t = (1-a)\pi_t^* - \omega y_t - i^* + \vartheta_1 m + \vartheta_2 isf + (\delta - a)\varepsilon^d - b\varepsilon^s \quad (10)$$

Here, $\boldsymbol{\pi_t}$ inflation rate (dependent variable), explained by $\boldsymbol{\pi_t^*}$ is the lagged value of inflation. This variable provides information on the rate of inflation achieved. $\boldsymbol{y_t}$**,** the growth rate of gross domestic product, $\boldsymbol{i}^*$ the interest rate of the central banker, $\boldsymbol{m}$ rank spillover effects cause by financial changes, ***isf*** rank policy stabilisation, ε^s and ε^d measure changes in the economic environment. This theoretical framework leads to the following assumption: *dealing with the adverse effect of financial sector development, policy stabilisation ensures the attainment of monetary stability objectives*.

4.2. Econometric Methodology

After formalising how the monetary stability objective deals with shocks Gallic et al, (2017) use the VAR model to estimate the impact of these shocks on this monetary stability objective. In the same line, while using the different econometric methods, Effiong (2020) seems to us more appropriate than the method of Gallic et al (2017) because no restrictions are imposed on the variables. The econometric framework of Effiong (2020) allows a better understanding of the effects of financial sector development on the objective of monetary stability. Contrary to a single econometric method as Effiong (2020) did, two econometric methods can be used to estimate this relationship: The ordinary Least Squares method with fixed effects and the Generalized Method of Moments in the system. Estimation with the ordinary least squares method with fixed effects facilitates the control of country heterogeneity and stable structural variables over time that may have been omitted. Two tests are associated with this method: the Fisher test and the Hausman test. The Fisher test reports the overall significance of the specific effects introduced.

The Hausman test allows the choice between specifications[5].The second method, Blundell and Bond's (1998) estimator is a double advantage shared with GMMs in the first difference method makes it easy to estimate equations with a dynamic structure (presence of a lagged dependent variable present in the equation). This econometric approach has the answer to the question of statistical inference of a regression faced with OLS. Thus, its ability to handle the delicate treatment of instrument choice makes this technique more interesting.

The Blundell and Bond (1998) estimator combines for each period a first difference equation with the level equation, this allows the estimation of a system of equations simultaneously by the method of generalized moments. The characteristic of this system assures the convergence of the estimator even if the number of observations is of finite size (Effiong, 2020), Blundell and Bond's (1998) approach allows the level model and the first difference model to be stacked in the system of equations is as follows:

$$\begin{pmatrix} Y_{it} \\ \Delta Y_{i,t} \end{pmatrix} = \partial \begin{pmatrix} Y_{i,t-1} \\ \Delta Y_{i,t-1} \end{pmatrix} + \begin{pmatrix} X_{i,t} \\ \Delta X_{i,t} \end{pmatrix} \beta + \begin{pmatrix} \varepsilon_{i,t} \\ \Delta \varepsilon_{i,t} \end{pmatrix} \qquad (11)$$

The instruments provide in Blundell and Bond's (1998) systems are relevant because even a correlation between the level variables and the country-specific effects in the second equation exists, no correlation between differentiated variables and specific effects can be found. Thus, Blundell and Bond (1998) introduce additional conditions to the Arellano and Bond (1991) condition. These complement conditions introduced concerns especially the level equation in the system. The condition of the moments is written as follows:

$$E[X_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-s-1}).(\eta_i + \varepsilon_{i,t})] = 0 \; pour \; s = 1; \;\; t = 2, \dots, T. \qquad (i)$$

$$E[y_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-s-1}).(\eta_i + \varepsilon_{i,t})\,] = 0 \; pour \; s = 1; \; t = 2, \dots, T. \qquad (ii)$$

$$E[y_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})\,] = 0 \; pour \; s \geq 2; t = 2, \dots, T \qquad (iii)$$

$$E[X_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \; pour \; s \geq 2; t = 2, \dots, T \qquad (iv)$$

The identification of the solution set by the GMM system technique depends on the validity of the following assumptions: -error terms are not self-correlated, -instrumental variables used are valid. To make sure that these assumptions are met, Blundell and Bond (1998) introduced two other tests: the Sargan/Hansen tests (check for over-identification and the validity of the instruments used in the estimation) and the absence of autocorrelation of error terms test (this test implies that the estimator of the instrumental variables, i.e. the number of instruments (p), is greater than the number of explanatory variables (k) included in the model).

4.3. Data

The sample is made up of the panel of the six CEMAC countries (Cameroon, Chad, Congo, Gabon, Equatorial Guinea and CAR) over the period between 2000-2018. The study is used annual data extracted from World Development Indicators (WDI) of the World Bank database of 2021 complemented by the data set of the Central Bank of African States (BEAC). World Development Indicators data are the main variables of the macroeconomic environment (inflation rate, growth rate, budget balance). Data on the soundness of the banking system and the quality of assets (credit to the non-financial private sector, TIAO interest rate of the central bank, risk of credit rank by non-performing loans come from the data set of the Central Bank of African States (BEAC). Thus a stabilisation policy is a rank with a banking regulation index constructed through a principal component Analysis

[5] In fact, the Hausman test facilitates the choice between fixed and random specific effects specifications, the criterion lead to decide between two types of effects (fixed (βf) or random (βa)). The approach is to compare the variance-covariance matrix between the two estimators defined as follows: $H = (\beta f - \beta a)' \; [\, var(\beta f - \beta a)^{-1} \,] \, (\beta f - \beta a)$.

(PCA) just as Creel et al (2015) did. The data used to construct this banking policy stabilisation index are: return on assets, liquidity ratio and return on equity are set by the Central African Banking Commission (COBAC). The trend of this index is contained in annex 1.

5. EMPIRICAL RESULTS AND ANALYSIS

Specifically, the empirical model obtained from the harmonisation of the parameters of equation 10 is expressed as follows:

$$\pi_{i,t} = \beta_0 + \partial\pi_{i,t-1} + \beta_1 y_{i,t} + \beta_2 I^*_{it} + \beta_3\, gM2_{i,t} + \beta_4\, DF_{i,t} + \beta_5\, ISF_{i,t} + \beta_6\, X_{i,t} + \mu_i + \lambda_t + \epsilon_{i,t} \qquad (12)$$

Here, i and t terms refer to country and time respectively; μi captures country effects and λt time effects, εit takes into account all errors related to e.g. omissions. *I** informs interest rate policy, *gM2* rank effect of the intermediate target of the monetary policy ISF_{it} rank backup provide by prudential policy to monetary policy (stabilisation policy) and finally X_{it} term is the vector of control variables. To proceed further in estimation, Balgati (2005) states that the stationarity check due to the presence of lagged value is required and Im Pesaran and Shin (IPS) test is relevant in the case of GMM techniques (table 1).

Table 1. IPS Stationary Test

Variables	Level		Indifference	
	z-stat	**prob**	**z-stat**	**prob**
Inflation	-5.0914	0.0000	-6.7247	0.0000
credit	0.1622	0. 5644	-4.8058	0.0000
Risk of credit	-0.8073	0. 2098	-5.0314	0.0000
Stabilisation policy	-3.4778	0.0003	-6.2271	0.0000
Interest rate	2.6633	0.9961	-3.8464	0.0001
gM2	-5.0801	0.0000	-6.7273	0.0000
Growth rate	-4.8986	0.0000	-6.2808	0.0000
Oil price	-0.7980	0.2124	-4.8884	0.0000
Budget balance	-1.3119	0.0948	-4.3054	0.0000

This Im Pesaran and Shin (IPS) test is based on the p-value associated with the IPS W-Stat statistic. The test opposes[6] a null hypothesis (H0) to an alternative hypothesis (H1). The decision rule used for this IPS test is as follows: if the p-value associated with the IPS statistic is less than α (Z-stat <5%) with a 5% significance level, then we accept H0. For Nyanda (2021) after running the IPS test, introduce Blundell and Bond (1998) tests: Sargan/Hansen tests and absence of autocorrelation of error terms test is required is necessary. Just like the stationarity test, which controls the integrated order of variables, those two tests determine whether the specifications of the estimated equation (number of equations depending on the author) are good. The Wald second-order autocorrelation test and the Sargan over-identification test are checked at P-value> α significance is controlled at 5%. The H0 hypothesis implies the absence of second-order autocorrelation of the first difference residuals and it gives a P-value=Prob>Z. This test is done at 5% expressly P-value> α. The over-identification test hypothesis H0 assumes the validity of the lagged variables used as instruments and gives a p-value=Prob>chi2. This test is done at 5% expressly P-value> α. For both two tests, the H0 hypothesis is verified. Summary results of these different tests are provided in the last line of table 2. The reference equation (equation 12), including all variables of the model (equation 12.1) is complete with two other specifications (equation 12.2 and 12.3).

[6] H0: All individual series in the panel contain a unit root,
H1: At least one of the individual series in the panel is stationary.

Table 2. Estimation Result Using GMM System

Dependent variable: Inflation						
Variables	**10.1**		**10.2**		**10.3**	
	Coefficient	**t-student**	**Coefficient**	**t-student**	**Coefficient**	**t-student**
L.Inflation	0.222	0.095	0.216	0.095	0.222	0.095
Credit	-0. 467	0.516	-0.292	0.509	-0. 476	0.506
Credit risk	6.057	0.638	6.091	0.632	6.078	0.642
Stabilisation policy	-0.732	0.559	-0.728	0.648	-0.749	0.645
TIAO	-0.169	0.693	-0.197	0.691	--	--
gM2	1.511	2.111	--	--	1.681*	2.111
Growth rate	-0.028	0.047	-0.059	0.048	-0.048	0.048
Oil price	0.060**	0.028	0.062**	0.028	0.059**	0.027
Budget balance	-6. 045	6.223	-6.200	5.207	-5.447	5.227
Constant	1.434	0.494	1.465	0.492	1.466	0.478
Auto-correlation test	0.650		0.687		0.640	
over-identification test	0.157		0.132		0.140	

Source: Author calculation. Note: *, ** & *** denote 10%, 5% &1% significance levels respectively values

The two equations (equations 12.2 and 12.3) make it easy to seize the opportunity of the central banker to choose a suitable instrument based on the perception of the environment's state. This approach is built on Cecchetti (2001) analysis. The shape of those two specifications was based on the main policy instruments of BEAC (interest rate TIAO and money supply (or liquidity flow)). Those tools have been instrumented jointly and separately enabling the changeover of instruments. Regarding the result, the first comment concerns the impact of the lagged inflation rate. Lagged inflation rate has a positive impact on the inflation rate of the next period. For all equations coefficients obtained are nearby 0.22 points. The result implies that the inflation rate of the previous period tends to push up the current inflation rate.

The results provided by the OLS with fixed displays in annex 1 confirm this influence. The financial sector development measured by the variable private sector credit as a percentage of GDP is extensively used in literature (Keho, 2009; Kim et al., 2010; Effiong, 2020; Batayneh et al, 2021; Nyanda, 2021) draw the negative relationship with inflation found in this literature. Inflation and capacity to supply the private sector with credit move in opposite directions. This result shows that while price instability increases in CEMAC countries, people save less money. And this reduction affects the performance of the financial sector reflected in the diminution of capacity to supply credit. It is therefore not strange to see that credit risk increases inflation.

The non-performing loans widely used in literature (Fofack, 2005; Antonin, 2018; Onomo, 2021; Foglia, 2022) draw the fact that banks extend credit to economic agents who do not return the credit on time. These adverse effects hold in credit allocation, in turn, harm the performance of the financial sector and the downside is that it increases price instability. Credit risk (non-performing loans) raises inflation nearby 6.1 per cent. This finding implies that a spillover effect of financial sector development is the main determinant that holds back the central banker's objective of monetary stability.

The implications for the CEMAC sub-region is that, credit risk accompanied by an increase in price instability downside financial sector performance and prevent the central bank from achieving its objective of internal monetary stability. With regard to the impact of the banking sector stabilising policy, this banking regulation wants to contain this negative externality associated with financial sector development (growth of credit risk) reducing the performance of this sector. Its effect is still weak reduces the risk of inflation nearby 0.7. The stabilisation policies play a role by monitoring the structure and the conduct of these financial institutions.

However, the control of financial institutions must be complemented by determining the level of credit risk incurred by financial sector actors. Kobou and Ayuk (2016) emphasise this lack of consistency in policy regulation. Accordingly with authors this deficiency can be the cause of the weak impact observed in all the specification. Therefore, highlighting that lowering effect on inflation rate confirms that strengthening banking sector regulation tools in CEMAC may improve the backup to monetary stability objective. Beyond the

coefficients, policymakers should seek to promote better alignment of their transmission channel of banking sector stabilisation requirements (banking sector regulation tools).

The need to strengthen the tool is to ensure that these regulatory instruments do not vary over the economic cycle because if financial sector actors are considered as over-liquid how credit risk increases inflation to these proportions. This situation is of utmost interest because is likely to create spirals of excess liquidity, illiquidity, insolvency in CEMAC. To close this result analysis section, a positive sign of oil price and a negative sign of budget balance reflect the effect of exogenous shocks on central banker objective. The supply shock (oil price) increases the inflation rate. This positive sign is independent of the choice of rules or targets made by central bankers' implying that it holds back the achievement of the monetary stability objective.

It indicates that a different effect occurs on central banker operations when oil prices change. Controlling that shock would improve central bankers' actions. The negative sign of the budget balance shows that the fight against inflation relies on the rigour of monetary policy moving in the opposite direction from the fiscal policy instrument. This relationship implies that the combination of a restrictive monetary policy objective with expansionary budgets for the different states leads to divergent orientations. The proper action is needed because such environment can not only reduce effectiveness of central bank instruments and policies, but also hold back his target (low inflation).

6. CONCLUSION

This work determines the link between financial sector development and monetary stability in CEMAC. Facing the new challenge due to the improvement financial sector and its influence on central bank action, a growing change observe in recent years display the need to find what can be obtain from the relationship between financial sector development and central bank objective. The number of studies which have explored this question empirically still relatively limited and the results seem to be mixed. This paper adds to this literature by providing evidence on the ambiguous impact of financial sector development over the action of the central bank. The results suggest the relevance of a more active central banker.

The environment’s state on monetary policy noted by Krause and Roja (2006) has been found in the CEMAC case. In accordance with the instruments used by the BEAC, three equations were estimated. The first version integrated two main monetary policy instruments of BEAC (the TIAO and the monetary base). The other equation analysed separately the effect of these two instruments. Using panel data of 6 member countries of a monetary union over 2000 to 2018, the data used comes from the World Bank (WDI, 2021) and the Centrale Bank of African States (BEAC). A GMM-system has been performing. The key results emerge from this paper highlighted elements hindering the monetary stability objective in CEMAC.

If the analysis shows that there are two aspects determinants of monetary instability, the result highlighted the influence of the undesirable effects of financial sector development. Those undesirable effects are holding back the monetary stability in CEMAC. The credit risks appear as the main cause of monetary instability and the main undesirable effects of financial sector development. Yet, the main source of inflation rate increases in CEMAC. To deal with this problem stabilising the banking sector appears as a proper backup. This idea abides on the fact that, despite being over-liquid, how come that such level of credit risk encountered.

Moreover, how come that this credit encountered in the banking system of CEMAC increases inflation to these proportions. The raison is simple the lender will never acquire the right information from the borrower. In accordance with this comment to be surer of the relation between lender and borrower, the central banker should be involved in this transaction to reduce the negative influence of adverse effects. As for CEMAC, central banker is the relevant stakeholder its implication is needed to ensure the success of its policy and the fulfilment of its targets.

The assistance provides by prudential policy tools stabs to reduce the negative influence of adverse effects (determinants of monetary instability and influence of the undesirable effects of financial sector development). Therefore, as this stabilisation policy succeeds in mitigating the negative consequences of financial sector development, policymakers are requested to seek how to promote better alignment of their transmission channel so that those regulatory instruments offer better assistance to preserve the monetary stability objective. The banking sector stabilisation require a deeper look for its consolidation to make sure that these regulatory instruments do not vary over the economic cycle.

AUTHORS' DECLARATION
This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support.

AUTHORS' CONTRIBUTIONS

All sections are written by the author.

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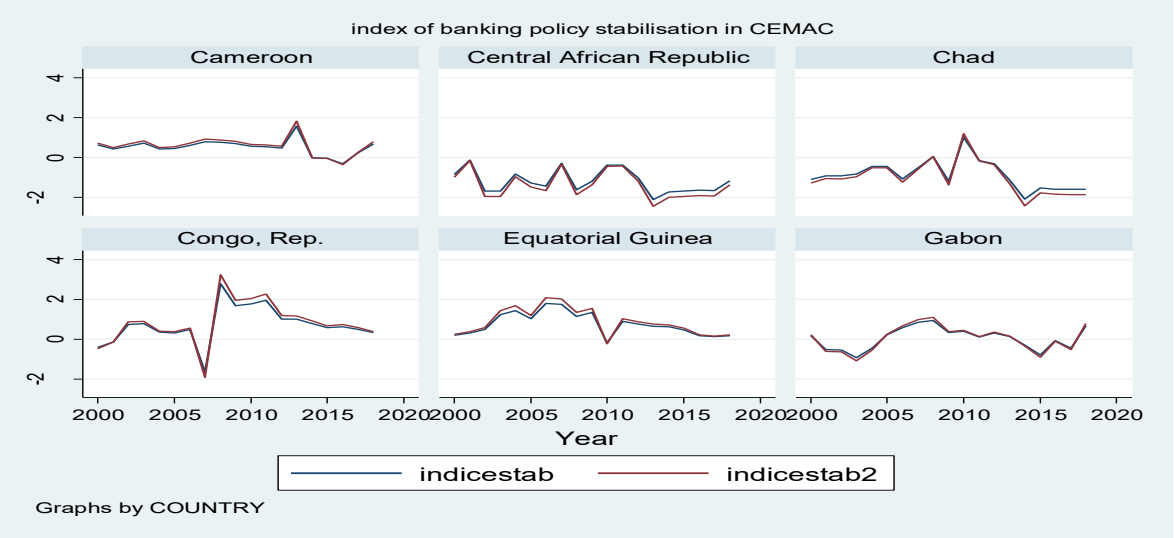
ANNEXES

Annex1. Trend of Banking Policy Stabilisation Index by CEMAC Country



Annex 2. Effect of Financial Sector Development on Monetary Stability in the CEMAC: Fixed Effects Model

Variables	**10.1 Inflation**	**10.2 Inflation**	**10.3 Inflation**
g. inflation	0.1431603 (0.102736)	0.139219 (0.10278)	0.1380459 (0.1023431)
Credit	-0.92001 (0.7550211)	-0.34728 (0.53945)	-0.96799 (0.74259)
Credit risk	6.320645 (6.771926)	6.320736 (6.77881)	6.036948 (6.738396)
Stabilisation policy	-0.15176 (0.75313)	-0.007261 (0.750662)	0.2272288 (0.7598413)
TIAO	0.10377 (0.72131)	-0.06103 (0.72096)	--------
gM2	2.42e-13 (2.24e-13)**	-----	2.69e-13 (2.22e-13)**
Growth rate	-0.013712 (0.0501)	-0.007418 (0.04982)	0.014467 (0.049508)
Oil-price	0.06396 (0.02881)**	0.06711 (0.028694)**	0.599298 (0.284171)**
Budget balance	-6.00472 (5.32972)	-5.59934 (5.32196)	-6.780689 (5.319647)
Constante	1.7152 (0.54729)	1.766868 (0.5457607)	1.537679 (0.487426)
Observations Number of countries R^2 * within	102 6 18%	102 6 16.85%	102 6 18%

Source: Author, note: *, ** & *** denote 10%, 5% &1% significance levels respectively values

International Journal of Business & Economic Studies
Year: 2022, Vol: 4, No:1, pp.26-44
https://doi.org/10.54821/uiecd.1092420

Value Relevance Analysis of Corporate Social Responsibility Disclosure with Board of Director Diversity as The Moderating Variable

Düzenleyici Değişken Olarak Yönetim Kurulu Çeşitliliği ile Kurumsal Sosyal Sorumluluk Açıklamasının Değer Uygunluk Analizi

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Received : 31.03.2022
Revised : 22.06.2022
Accepted : 27.06.2022
Type of Article : Research

Keywords:

Corporate Social Responsibility Disclosure,

Director Diversity,

GRI Standards,

Value Relevance,

Jel Codes:
A13, G34, L25

ABSTRACT

Value relevance is the ability of information to assist reports in making users able to make the decision quickly. Corporate disclosure is said to be relevant if the information can influence the economic decisions of its users. One of the corporate disclosures is about the companies' social responsibility. This study aims to see the value and relevance of CSR Disclosure. The object of this research is all companies listed on the IDX in 2018 – 2020, which publish an annual report of 317 observation companies. The data used is taken from the company's annual report. This study examines the effect of CSR Disclosure on value relevance with board diversity (gender, age, and education) as the moderating variable and ROA as the controlling variable. Using descriptive statistical tests and regression analysis ensures that CSR Disclosure does not affect the value of relevance, meaning that it does not affect the reactions and considerations of investors' decisions. The moderating variable has also not been able to provide a significant influence on CSR Disclosure and its effect on the value relevance even though all the moderating variables impact the relationship between the research model. On the other hand, ROA has a significant impact on ERC which means ROA has a positive and powerful impact on the value of relevance. This condition is due to investors' considerations that are still focused on the company's financial performance compared to the company's non-financial performance companies

Anahtar Kelimeler:

Kurumsal Sosyal Sorumluluk Açıklaması

Yönetici Farklılığı,

GRI Standartları,

Değer İlgisi

Jel Codes:
A13, G34, L25

ÖZET

Değer uygunluk düzeyi, kullanıcıların kararlarını hızlı bir şekilde verebilmelerini sağlamak için bilginin raporlara yardımcı olma yeteneğidir. Bilgi, kullanıcılarının ekonomik kararlarını etkileyebiliyorsa, kurumsal açıklama ile ilgili olduğu söylenir. Kurumsal açıklamalardan biri de şirketlerin sosyal sorumluluklarına ilişkindir. Bu çalışma, KSS açıklamalarının değerini ve uygunluğunu görmeyi amaçlamaktadır. Araştırmanın ana unsuru, 317 gözlem şirketinin yıllık raporunu yayınlayan 2018 – 2020 yıllarında IDX'te listelenen tüm şirketlerdir. Kullanılan veriler şirketlerin faaliyet raporlarından alınmıştır. Araştırma, CSR açıklamalarının yönetim değişkeni olarak yönetim kurulu çeşitliliği (cinsiyet, yaş ve eğitim) ve kontrol değişkeni olarak ROA ile değer ilişkisini incelemektedir. Tanımlayıcı istatistiki testler ve regresyon analizleri, KSS açıklamalarının ilgililik değerini etkilemediğini yani yatırımcı tepkilerini ve değerlendirmelerini etkilemediğini göstermektedir. Düzenleyici değişkenin KSS açıklamaları ve değer ilgisi üzerinde bir etkisi olmasa da araştırma modelini etkilemektedir. Bunun yanında, ROA'nın ERC üzerinde önemli bir etkisi bulunmakta, bu da ROA'nın ilgi değeri üzerinde olumlu ve güçlü bir etkisi olduğu anlamına gelmektedir. Bu durum, yatırımcıların halen finansal performans göstermeyen şirketlere kıyasla diğer şirketlerin finansal performansına odaklanmış değerlendirmelerinden kaynaklanmaktadır.

Suggested Citation: Wulan, D. F. , Lindrianasari, Amelia, Y. & Gamayuni, R. R. (2022). Value Relevance Analysis of Corporate Social Responsibility Disclosure with Board of Director Diversity as The Moderating Variable. *International Journal of Business and Economic Studies*, 4(1), 26-44, Doi: https://doi.org/10.54821/uiecd.1092420

1. INTRODUCTION

The concept of one of the concepts in accounting, namely the "Triple Bottom Line" (3BL), which John Elkington introduced in 1994, has often been a topic of discussion among managers, consultants, investors, and companies over the last few decades (Norman & Macdonald, 2004). According to research by Feng *et al*. (2020), social responsibility based on the "Triple Bottom Line" (3BL) concept is an important issue that creates concern in society and the social environment.

World problems regarding the environmental problems such as global warming and social issues such as employment, disease, unemployment, human rights, crime, and social inequality have become a point of great concern for all people, especially corporations in the world (Randa & Liman, 2012). Environmental pollution and land destruction are the main problems carried out by humans, not only individuals but also companies or corporations, where their activities cause much harm to the environment. Company or factory waste has a terrible impact on the surrounding ecosystem, which poses a substantial danger not only in the short term but also in the long term.

The company is expected to be able to publish a report or report that can show its contribution to various problems that occur so that it can be seen how much the company has to spend on environmental management. In order to maximize the implementation of social responsibility disclosures, several companies have formed a CSR committee as part of the board of commissioners and a CSO (Chief Sustainability Officer) within the company's board of directors that seeks to provide policies and decisions focused on this topic (García-Sánchez et al., 2019). The CSR and CSO committees recommend the company's social or environmental issues (Velte & Stawinoga, 2020). However, this has not been fully implemented by all Indonesian companies, so implementing social responsibility disclosure in Indonesia is still not optimal even though many regulations and policies have been set so that companies can continue to carry out their social responsibilities.

Various efforts have been made by the government and existing regulators. In addition to the formation of the regulations described previously, awards are also given by the government in collaboration with the private sector and other environmental communities in giving appreciation to companies that have excellent programs in social responsibility based on various categories and criteria. One of the appreciations given to companies with good social and environmental programs is the Indonesia Sustainability Reporting Award (ISRA), held since 2005. The organizers and the government hope that this activity will provide motivation and enthusiasm for companies in Indonesia to be able to contribute to the environment.

According to the existing phenomenon, companies need to carry out corporate social responsibility programs to provide a more corporate role that illustrates the company's concern for environmental and social issues in the community. Even according to Anas *et al*. (2015); Asmeri *et al*. (2017); Chan *et al*. (2014); Masliza *et al*. (2021), currently, many stakeholders are interested not only in the financial performance of a company or organization but also in the non-financial performance of the company in making decisions. So, it can be concluded that the disclosure of the company's financial and non-financial performance has an accounting relevance value for the market or investors. In research conducted by (Haryanto, 2018), it is stated that the value of relevance is the ability of information to help report users in differentiating several choices in decisions that result in users being able to make choices easily. The information is also relevant or related to investment decisions if the information can confirm the uncertainty of a decision that has been made so that the decision will be maintained or changed. Reliable information means that the information is reliable, precise, and free from bias or manipulation by management (Gamayuni, 2012). Scott and O'Brien, (2003) also said that When stock prices react to the disclosure of information, it can be said that the information has value relevance.

Social responsibility disclosure is expected to signal and sign to external parties, especially investors. Investors' considerations arising from the disclosure of social responsibility will influence the market on the company's reported earnings because investors will not only use information about company profits but also use the information contained in the company's CSR reports in making investment decisions (Awuy, 2017). This condition is also in line with research conducted by Alotaibi & Hussainey (2016); Farhana & Adelina (2019); Rahman et al. (2020), which states that the disclosure of corporate social responsibility has value relevance to the reaction of several other studies have concluded that the disclosure of corporate social responsibility affects market reactions as measured by stock prices.

In line with what was stated by Baskoro & Umar (2021); Nuriyanto et al. (2020); Saragih & Rusdi (2020), where disclosures made by companies, especially regarding CSR or social responsibility, are related to the market response to companies positively often associated with measuring the company's share price. This is due to many investors who know the importance of the company's concern for social conditions and the surrounding

environment. Nevertheless, on the other hand, according to research conducted by Karuniawan & Nugrahanti (2022); Narullia *et al*. (2019); Nuriyanto *et al*. (2020), the disclosure of social responsibility has no value relevance, so it does not have any influence and even has a negative influence on investor decision making on the company. This can happen in certain situations, one of which is when investors tend to only look at the performance of financial companies.

The board of directors is one of the vital points in the company's problems that require them to have a role in decision making and policy making related to corporate social responsibility (Nguyen *et al*., 2021). Diversity of directors is something that is needed in the composition of the directors of a company. The diversity of directors is considered to be able to provide convenience in solving various problems because the different characteristics of each director provide many valuable insights into decision making. According to Naveed *et al*. (2021), the diversity of directors encourages the emergence of various perspectives in the discussion, which is motivated by a combination of diverse intellectuals that will potentially impact the company's subsequent performance. A Board of directors with heterogeneity in ability, knowledge, background, and expertise are significant in decision making (Katmon *et al*., 2019).

Based on the above background, previous research still has various and varied conclusions, so it is necessary to conduct this research. In addition, this study also expands research observations where the companies studied are all listed companies on the Indonesia Stock Exchange (IDX), so they are expected to provide better observation results. Another update carried out in this study is to add a moderating variable, namely the diversity of directors as measured by using proxies for gender, age, and education. Diversity of directors is considered to be able to strengthen the effect of disclosure of corporate social responsibility because the diversity or differences present on a company's board of directors will enrich discussions with different backgrounds. We also use the control variable, Return on Assets (ROA), as the proxy to know whether the financial performance of the companies affects the value relevance. In addition, this study also added several indicators for measuring the disclosure of Corporate Social Responsibility from previous research.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Agency Theory

Agency theory describes top managers in large modern corporations as agents with interests different from those of the principal or shareholders, where both the agent and the principal are utility maximizers. Based on this theory, the possibility of principal losses can be caused by differences in information or asymmetrical information, and this difference in information may be caused by different interests between the principal and the agent. According to Calvo & Calvo (2018), a relationship between principals and agents should be able to provide efficiency in information management and other risk costs. The owner and manager are assumed to be rational parties motivated by self-interest, but these parties cannot distinguish between awards for preferences, beliefs, and the information they get. Therefore, the rights and obligations of the owner and manager of the company are explained in a mutually beneficial work agreement (Raharjo, 2007).

Conflicts of interest in agency relationships can occur anytime and anywhere. The emergence of a conflict of interest between the owner and manager is caused by the possibility of a situation where the agent makes decisions and behaviours that are not what was previously agreed upon by the two parties so that it will cause agency costs. Agency costs that arise due to conflicts that can arise due to differences in interests here are in the form of information asymmetry between management and owners where this problem can provide an opportunity for management to take opportunistic actions that aim to provide company performance reports that seem better than what is usually called. With earnings management. This will undoubtedly harm the owners, who cannot know the actual financial condition of the company. It takes company conditions following existing ones to reduce the asymmetry of symmetry that can arise and lead to conflicts when conflict conditions occur. Companies can issue a report on corporate social responsibility as one of the things that the company can share as a company performance to reduce age

2.2. Signal Theory

The originator of this signalling theory is Spence, who conducted a study entitled Job Market Signaling in 1973. Spence (1973) stated that asymmetric information occurs in the labour market. Therefore, Spence created a signal criterion to add power to decision-making. The signal theory states that a good company will give an excellent signal to the public and the market because the market is expected to characterize which companies are good and which are not good (Suhadak *et al*., 2019). In the disclosure of the annual report, the company's reported

performance can affect the investment signal that the company can obtain. This is undoubtedly crucial for companies listed on the stock exchange because it dramatically affects the level of investment that will be received. The signal theory also focuses on the importance of the information provided and issued by the company because it will impact many things that affect the company, such as the level of investment in the company (Agustina & Baroroh, 2016). If the information is good, the market and community response will also be good (Purwanto & Agustin, 2017). Disclosure of social responsibility can provide a signal to external parties or existing markets, and this signal can give a good reaction or vice versa.

2.3. Value Relevance

According to Kuswanto (2020), accounting information is said to have value relevance if it is statistically related to the market price of a stock. Accounting information is estimated to have relevant value because accounting information has a statistical relationship with the stock market value (Alamsyah, 2017). This value relevance concept explains how investors react to the announcement of accounting information, which will affect how investors make decisions and deal with an investment consideration. This reaction will prove that the content of accounting information is an essential consideration in the investment decision-making process, so it can be said that accounting information benefits investors (Puspitaningtyas, 2012).

The more relevant an accounting information is, it will move in line with investor confidence in determining investment choices to be made. Later this activity will also have a domino effect on stock prices and subsequent market reactions, so it can be said that accounting information has value relevance (Scott and O'Brien, 2003). Financial reports can also help investors see how the company's performance will be in the future and how the company will give a good or wrong signal to the market (Wulandari & Adiati, 2016).

2.4. Earning Response Coefficient

Earning Response Coefficient (ERC) measures investor reactions to net income announcements. Profits of good quality are profits that can reflect the company's financial performance without engineering and are real so that they will not cause interference in decision making. A high level of profit is good news for investors (Tulhasanah & Nikmah, 2019). The ERC is a coefficient obtained from the regression between stock prices and surprise accounting earnings. The stock price is calculated by Cumulative Abnormal Return (CAR), while the surprise accounting profit is calculated by Unexpected Earnings (EU) (Haryanto, 2019).

In his book entitled Financial Accounting Theory, Scott and O'Brien, (2003), states that the Earnings Response Coefficient (ERC) calculates the number of stock returns in response to the profit figures issued by the company. This reaction can describe the quality of the company's reported earnings. Later, the high or low Earning Response Coefficient (ERC) is determined by the responsiveness strength, which is reflected in the information in the company's financial performance (Paramita & Hidayanti, 2013). Earning Response Coefficient (ERC) is a measurement used to see the market reaction to disclosures made by companies; where one of the disclosures made by companies that can affect market reactions is the disclosure of corporate social responsibility. Later, with additional information obtained from the disclosure of corporate social responsibility, it is assumed that it will positively influence the Earnings Response Coefficient (ERC).

2.5. Corporate Social Responsibility Disclosure

Corporate Social Responsibility or CSR is a responsible business carried out by companies for risks arising from decisions and activities that have been taken by related companies, where the resulting impact will affect related parties, including the community and the environment (Widianingsih, 2018). According to Putri & Christiawan (2014), corporate social responsibility (CSR) is a form of responsibility given by companies in the environmental and social fields to increase the company's commercial value without leaving ethical and cultural values to the environment and society based on the principles of People, Planet, and Profit.

CSR reporting and disclosure is a report issued by a company that provides information about the company's activities, initiatives, and image related to the environment, employees, customer service, energy use, fairness, fair business, corporate governance, and others (Suharyani *et al*., 2019). One of the benefits of CSR reporting is that it can be used as one of the company's media to communicate with stakeholders. For effective communication, the information provided must meet the readers' needs (stakeholders). Many indicators can be used to measure the quality of corporate social responsibility disclosure. One of several reporting standard indicators used as a guide in social accounting, auditing, and reporting is the Global Reporting Initiative's (GRI) Sustainability Reporting Guidelines. GRI is an international standard organization that issues the most widely used and trusted reporting standards in sustainable reporting (Wulolo & Rahmawati, 2017). The level of Corporate Social

Responsibility disclosure is measured using 158 standard GRI points and several other additional indicators from previous research.

2.6. Return on Assets (ROA)

ROA is a ratio that measures the company's ability to generate profits by using the total assets owned by the company after adjusting for costs to become these assets (Junaeni, 2017). Investing in the capital market can be reflected by obtaining returns on the selected shares. Investors generally use fundamental analysis techniques to assess company performance to estimate returns. When ROA has a low value, it can be caused by the company conducting financial restructuring to improve company performance or investments that impact the sustainability of the company's performance in the long term, but not in the short term. This condition makes the company's stock price not increase so that the increase in return on assets will not impact the company's stock return (Arista & Astohar, 2012). Meanwhile, on the other hand, according to Gunadi & Kesuma (2015); Sholichah (2015); Watung & Ilat (2016), ROA has a positive and significant influence on stock prices which influences investor decision-making due to the assumption that the more excellent the ROA value, the higher the performance. The company will be considered better, and the same condition happens the other way around.

2.7. Board of Director Diversity

Diversity is defined as the social, cultural, physical, and environmental differences that affect how people think and behave. According to Wijaya and Suprasto (2015), there are several definitions of board diversity, one of which is the difference in distribution between committee members and directors, which consists of individuals and characteristics spread throughout the company. Diversity is a difference that can be seen in gender, age, culture, and others that can provide different characteristics, opinions, and knowledge in the underlying internal decision-making processes (Anjani, 2018). The diversity variables used in this study were gender, age, and education. These three variables are the most widely used in measuring the diversity of directors based on previous research. In measuring the level of diversity of directors, a table for measuring the level of diversity is made for each criterion.

For the measurement of the diversity of directors based on gender, the more diverse the gender of a director, the value generated from the above measurement will approach the value of 50%, where the number of male and female directors is almost balanced. For measuring the diversity of directors based on age, it was determined that the higher the measurement value, the directors considered having more young members, so it is believed that it can improve the quality of corporate social responsibility disclosure (Colakoglu *et al*., 2021). Meanwhile, for the measurement of the diversity of directors based on age, it was determined that the higher the measurement value, the directors considered having more young members so that it is acknowledged that it can improve the quality of corporate social responsibility disclosure.

All these criteria are described by the tabulation of characteristics as follows:

Table 1. Gender Diversity Characterization

Percentage	Note	Level
0% - 20%	Poor	1
21% - 40%	Moderate	2
41% - 60%	Good	3
61% - 80%	Moderate	2
81% - 100%	Poor	1

Table 2. Age and Education Diversity Characterization

Percentage	Note	Level
0% - 20%	Poor	1
21% - 40%	Deficient	2
41% - 60%	Enough	3
61% - 80%	Good	4
81% - 100%	Very Good	5

2.8. Previous Research

Research conducted to see whether there is a value relevance to the disclosure of corporate social responsibility has been carried out by many researchers, both conducted in Indonesia and outside Indonesia. Based on research conducted by Aureli *et al*. (2020); Azizah *et al*. (2021); Baskoro & Umar (2021); Istianingsih *et al*. (2020); Narullia & Subroto (2018), stated that the disclosure of corporate social and environmental responsibility positively affects the market value associated with the company as measured by the Earning Response Coefficient. This shows that the better and more complete the disclosure and the higher the suitability of the disclosures made by the company, the higher the influence on the market and affects optimistic assumptions about the company and investor decision-making. So, it can be concluded that the disclosure of corporate responsibility has relevant value in consideration before investors invest.

Meanwhile, in several other studies, there are contradictory results which are based on research conducted by Homan (2011); Kim *et al*. (2018); Nuriyanto *et al*. (2020); Wijayanto & Putri (2018), found that the disclosure of corporate social responsibility and other environmental disclosures did not affect the company's market value as measured in the earnings response coefficient. This shows that there is no relevance between the company's disclosures and the value of the company in society and does not influence the decision-making that investors usually do.

In addition, several previous studies, such as those conducted by Anazonwu *et al*. (2018); Feng *et al*. (2020); Velte & Stawinoga (2020), many have investigated the relationship between the influence of directors' diversity and the disclosure of corporate social responsibility. Based on research conducted by Malik *et al*. (2020); Razak & Helmy (2020), the diversity of directors influences the disclosure of social responsibility. However, on the other hand, according to Orazalin (2019), the diversity of the directors does not affect the disclosure of corporate social responsibility.

2.9. Hypotheses Development

2.9.1. The Effect of Corporate Social Responsibility Disclosure on The Value of Relevance

According to research by Alim & Rizki (2019), in agency theory, stakeholders include shareholders and customers, suppliers, creditors, employees, and the public. Therefore, maximizing the interests of shareholders is no longer the company's only goal. Managers must consider other goals, including requirements and needs related to environmental behaviour, when these two aspects are directly related to society.

The signal theory, which Spence formed in 1973, states that the company will provide a signal to external and internal parties (Connelly *et al*., 2011). This signal is information about what management has done to fulfil the owner's wishes. Information published outside the company is essential because it influences investment decisions outside the company. Recent developments show that investors need accountability and assessment of company performance through profit reporting and corporate accountability reporting to employees, society, and the environment (Razak & Helmy, 2020).

Based on research conducted by Saragih & Rusdi (2020); Wahyuni (2020); Wicaksono (2018), the disclosure of corporate responsibility has a positive effect on the company's earnings response coefficient. This shows a value relevance of the disclosure of corporate responsibility, as seen from the market reaction to the information presented in the report. However, in a study conducted by Azizah *et al*. (2021); Homan (2011); Wulandari & Adiati (2016), the disclosure of corporate responsibility has no relevant value seen from the absence of a significant market reaction after the company made the disclosure. This shows that the disclosure of information presented by the company, especially those related to corporate responsibility, does not affect the influence of the market.

Based on the reference theory used and the gaps in previous research, the researcher formulated the following hypothesis:

Ha1: *Disclosure of Corporate Social Responsibility has a Positive Effect on Relevance Value.*

2.9.2. The Effect of Gender Diversity of Directors on the Relationship Between Corporate Social Responsibility Disclosures and Value Relevance

According to agency theory, the higher the diversity of the board of directors, the greater the ability to monitor management due to the increasing independence of the existing directors. The better the performance of the existing directors, it is expected to provide disclosure output that can increase the company's value in the market. The signal given can be done through the disclosure of accounting information, both financial and non-financial,

in the annual report. More comprehensive disclosure by companies as a signal to investors reduces transaction costs and risks posed by investors (Kartikarini & Mutmainah, 2013). Based on signal theory, management seeks to convey financial and non-financial information that it finds of great interest to investors and shareholders, especially if it is good news.

The gender diversity that exists among the directors will have a quality influence on the disclosure of corporate responsibility (Boukattaya & Omri, 2021; Fadli *et al*., 2019; Farida, 2019). This condition can be seen from the differences in background and mindset between female and male directors in making decisions. The more balanced the composition of female and male directors on the board of directors, the better the pattern of decision-making and policy-making, especially regarding the disclosure of corporate social responsibility. The better and more relevant the information presented will have a good influence on market reactions because, generally, the results show that more robust CSR reporting performance reduces adverse reactions (Wans, 2020). However, based on research conducted by Matitaputty & Davianti (2020); Nguyen *et al*. (2021), gender diversity in the board of directors does not affect the quality of reporting disclosures to companies.

Based on the reference theory used and the gaps in previous research, the researcher formulated the following hypothesis:

Ha2: *Gender Diversity The Board of Directors has a positive influence on the relationship between Corporate Social Responsibility and relevance value.*

2.9.3. The Effect of Age Diversity of Directors on the relationship between Corporate Social Responsibility Disclosures and value relevance

The company's information needs are based on information asymmetry between the company and external parties because the company knows more about the company's profile and prospects than outside parties (investors and creditors). However, income information can be distorted, so income information alone is not enough to be used as a decision reference (Dalimunthe, 2014). So, the provision of information will reduce the asymmetry of existing information W. E. Putri *et al*. (2020).

Based on research conducted by Damanik & Dewayanto (2021); Katmon *et al*. (2019); Berman et al. (1999), younger directors are more adept at dealing with the risks associated with disclosure of social responsibility. Meanwhile, senior directors are more careful in taking risks in implementing social responsibility. According to research conducted by Colakoglu *et al*. (2021); Khan *et al*. (2019); Orazalin (2019), the high proportion of young directors on the board of directors has a negative influence on the disclosure of corporate social responsibility.

Based on the reference theory used and the gaps in previous research, the researcher formulated the following hypothesis:

Ha3: *Age Diversity of Directors has a positive influence on the relationship between Corporate Social Responsibility and relevant value.*

2.9.4. The Effect of Educational Diversity of Directors on the relationship between Disclosure of Corporate Social Responsibility and value relevance

Signal theory explains encouraging companies to attract investors and provide information to outsiders who are expected to invest in the company. Investors catch this positive signal until investors invest in the company for company reporting and disclosure, and after the company signals to outsiders, the company's value will indirectly increase (Setyowati & Sari, 2019). Based on agency theory, companies cannot forget the reciprocal relationship in people's social life, which requires companies to not only fulfil their interests but also provide benefits to stakeholders by doing good reporting, especially disclosure of corporate responsibility reports (Khabibah & Mutmainah, 2013).

Based on the research of Beji *et al*. (2021); Damanik & Dewayanto (2021); Rahindayati *et al*. (2015), the educational background of the board of directors influences the disclosure of corporate social responsibility, while based on the research of Colakoglu *et al*. (2021); Katmon *et al*. (2019); Khan *et al*. (2019), the educational background of the directors does not affect the disclosure of corporate social responsibility.

Based on the reference theory used and the gaps in previous research, the researcher formulated the following hypothesis:

Ha4: *Educational Diversity of the Board of Directors has a positive influence on the relationship between Corporate Social Responsibility and the value of relevance.*

3. METHODOLOGY

3.1. Type of the Study

This study uses quantitative data types. While the data source used is a secondary data source, and secondary data is data obtained indirectly through the official website. This study uses secondary data obtained from the annual reports of companies listed on the IDX in 2018 – 2020, which are documented on the official website of the IDX, namely www.idx.co.id and the official website of related companies as well as the closing price of the company's shares at (Wans, 2020).

3.2. Observation

The population in this study are companies listed on the Indonesia Stock Exchange (IDX) which issue their annual reports in the year of observation. This study examines 517 companies listed on the Indonesia Stock Exchange for 2018 - 2020. After reducing the sample that does not meet the requirements, where 70 companies are currently in suspension and do not issue annual reports, this study examines a total of 317 listed financial and non-financial sector companies. on the Indonesia Stock Exchange.

Table 3. Total Observation

No.	Note	Amount
1	Companies Listed in IDX 2018 – 2020	539
2	Companies that are in a period of suspension and delisting process for 2018 – 2020	(70)
3	Companies that do not issue annual reports 2018 – 2020	(152)
Early Sample Total		317
Final Sample Total (3 Years)		951
Outlier		(308)
Total Observation		643

3.3. Research Method

The data analysis technique used in this research is descriptive analysis and regression analysis. Regression analysis used is linear regression analysis and moderated regression analysis. The following is the regression equation used:

$Y = \alpha + \beta_1 CSRD + \beta_2 ROA + e$ ... (i)

$Y = \alpha + \beta_1 CSRD + \beta_2 ROA + \beta_3 CSRD*GEN + \beta_4 ROA*GEN + e$ … (ii)

$Y = \alpha + \beta_1 CSRD + \beta_2 ROA + \beta_5 CSRD*AGE + \beta_6 ROA*AGE + e$ … (iii)

$Y = \alpha + \beta_1 CSRD + \beta_2 ROA + \beta_7 CSRD*EDU + \beta_8 ROA*EDU + e$ … (iv)

Y : Value Relevance
CSRD : Corporate Social Responsibility Disclosure
ROA : Return on Asset
GEN : Board of Director Gender Diversity
AGE : Board of Director Age Diversity
EDU : Board of Director Edu Diversity
α : Constanta
e : Error

Then to test the hypothesis, the test used is the F test (ANOVA) and t-test (partial) with the criteria that if the significance level is more than 0.05, then the hypothesis fails to be supported, meaning that the independent variable partially/simultaneously has no effect and is significant on the dependent variable. And if the level of significance is less than 0.05, then the hypothesis is supported, meaning that the independent variable partially/simultaneously has a significant and significant effect on the dependent variable.

Table 4. Variables and the Measurement

Variables	Measurement
Value Relevance	$ERC = \alpha + \beta UE_{i,t+} e$
Corporate Social Responsibility Disclosure	$CSRDIx = \frac{\Sigma Xix}{Nx}$
Return on Assets	$ROA = \frac{\text{Net Income}}{\text{Total Asset}}$
Board of Director Gender Diversity	$GEN = \frac{\text{Total Woman Director}}{\text{Total Director}}$
Board of Director Age Diversity	$AGE = \frac{\text{Total Director Aged Less than 40 Years Old}}{\text{Total Director}}$
Board of Director Edu Diversity	$EDU = \frac{\text{Total Director with Master Education or Above}}{\text{Total Director}}$

4. RESULTS

4.1. Statistic Descriptive Test

A statistical description of the data is needed to determine the characteristics of the data used in the study by looking at the mean, standard deviation, maximum value, and minimum value. Discussion on descriptive statistical tests will be carried out for each variable, namely the dependent variable (Earning Response Coefficient), the independent variable (Corporate Social Responsibility Disclosure), the control variable (Return on Assets) and the moderating variable (Gender Diversity, Age Diversity, Educational Diversity).

Table 5. Statistic Descriptive Test Results

Variable	Minimum	Maximum	Mean	Deviation Standard
ERC	-0,513	1,061	0,2334	0,1094
CSRD	0,114	0,646	0,3296	0,0992
ROA	-16,890	20,000	1,7008	5,3447
GENDER	1	3	1,59	0,717
AGE	1	4	1,59	1,001
EDUCATION	1	5	1,53	0,995

Based on the table above, it can be seen that for the dependent variable, the Earnings Response Coefficient (ERC), the minimum value is -0.513, and the maximum value is 1.061. The average value for this dependent variable is 0.2334, with a standard deviation of 0.1094. This value also shows that the observed data is homogeneous, seeing that the standard deviation value is smaller than the average value. In addition, it can be seen that for the independent variable, namely the disclosure of Corporate Social Responsibility (CSR), the minimum value is 0.114, and the maximum value is 0.646. The average value for this dependent variable is 0.3296, with a standard deviation of 0.0992. The standard deviation value, which is smaller than the mean value, also indicates that the observed data is homogeneous. For the following variable, it can be seen that for the dependent variable, namely Return on Assets (ROA), the minimum value is -16,890, and the maximum value is 20,000. The average value for this dependent variable is 1.7008, with a standard deviation of 5.3447. The value of the standard deviation of this variable also shows that the data being observed is varied, seeing that the standard deviation value is greater than the average value.

The first moderating variable, Gender Diversity, measured by a dummy variable, shows a minimum value of 1 and a maximum value of 3. A total of 134 companies has a gender diversity level of 1 (poor) in this variable which indicates that all of these companies have a board of directors with a composition gender imbalance where the company has a gender diversity percentage of 10% to 20% and 80% to 100%. As for companies with good grades, there are only 63 companies out of 317 samples. The age diversity variable shows a minimum value of 1 and a maximum value of 4. The average value for this dependent variable is 1.59, with a standard deviation of 1.001. Figure 1 shows that many companies have a board of directors aged under 40 years in the composition of the company's board of directors. Based on the sample used in this study, as many as 99 companies or about 31% of the IDX listed companies in 2018 - 2020 which were sampled in this study had a board of directors with a board of directors' composition age under 40 years old with poor criteria at the 0% to 20% level. While the results of

this study showed that there are 30 companies with a good level of age diversity. Based on the table above, the minimum value is 1; the maximum value is 5. The average value for this dependent variable is 1.53, with a standard deviation of 0.995. There are 17 companies with excellent educational diversity scores in this study. And 107 other companies with a minimum educational background of master/master/S2 at an insufficient level, namely at 10% to 20% of the total existing directors.

4.2. F-Test Results

A simultaneous test was conducted to test whether the independent variable affected the dependent variable simultaneously. This test can be done when there are two or more independent variables in a research model. The statistical tool used for the simultaneous test in this study is the ANOVA test by looks at the significance value of the test results. The results of this study indicate that there is a significant effect on all independent variables, which together affect the dependent variable.

Table 6. F-test Result

Regression Model	**F**	**Sig**
Multiple Regression Analysis (i)	13,815	0,000
Moderation Regression Analysis (ii)	6,119	0,000
Moderation Regression Analysis (iii)	5,884	0,000
Moderation Regression Analysis (iv)	8,011	0,000

Table 7. The Increasing Effects after Moderation

R dan R^2 (before moderation)	0,203	0,041	Conclusion
Moderating Variables	R (after moderation)	R^2 (after moderation)	
Gender	0,214	0,046	There is an increase
Age	0,210	0,044	There is an increase
Education	0,243	0,059	There is an increase

4.3. T-Test Results

A partial test was conducted to partially test the independent variable's effect on the dependent variable. This test uses multiple regression analysis with a confidence level of 95% or an alpha value of 5%. The t-test in this study was conducted to test the moderating variables one by one. Using this method, the researcher can see the effect of each of the moderating variables used (gender, age, and education) on their effect on the direct effect of the model (the influence of CSR) on the relevance value. With these four models, researchers can see the effect of strengthening or weakening each moderating variable.

4.3.1. T-Test Result for the 1st Model

Table 8. t-Test Result for the 1st Model

Variable	Regression Coefficent (β)	Sig.
Constanta	0,177	0,000
Independent Variable		
CSRD to ERC	0,199	0,273
Control Variable		
ROA to ERC	0,010	0,000

Based on the test results presented in the test results in table 4.9 above, it can be seen that the Corporate Social Responsibility (CSR) Disclosure variable has a t-count value of 1.097 and a significance value of 0.273. The significance value is more excellent or not smaller than the alpha value of 0.05. Meanwhile, the control variable's value, namely Return on Assets (ROA), can be seen to have a t-count value of 5.110 and a significance value of

0.000. This result shows that the disclosure of Corporate Social Responsibility (CSR) has a positive but not significant effect on the relevance value, so the first hypothesis is not supported.

Based on the results of the t test for the research model (i), it can be concluded that the multiple regression model in this study is:

$$ERC = 0{,}177 + 0{,}199CSRD + 0{,}010ROA \text{ (i)}$$

4.3.2. T-Test Result for the 2nd Model

Table 9. T-test Result for the 2nd Model

Variable	Regression Coefficent (β)	Sig.
Constanta	0,193	0,035
Independent Variable		
CSRD to ERC	0,199	0,273
Control Variable		
ROA to ERC	0,010	0,000
Moderation Variable		
GENDER	-0,006	0,906
GENDER*CSRD to ERC	0,067	0,653
GENDER*ROA to ERC	0,002	0,390

As seen in Table 4.9, the value of the coefficient of determination or R-Square where the R-Square value in the first test (not using moderating variables) is 0.005 or 0.5%. This value is smaller than the R-Square value in the testing of research model ii (using gender diversity as a moderating variable), which is 0.046 or 4.6%. So it can be concluded that the use of Gender Diversity can strengthen the influence of the Disclosure of Corporate Social Responsibility (CSR) positively on the value of relevance. Based on the results of the tests carried out in table 4.9 above, the data shows a significant value for the gender moderating variable of 0.653 with a t count of 0.450. The value is more excellent or not smaller than alpha 0.05. This shows that the second hypothesis is not supported.

Based on the results of the t test for the research model (ii), it can be concluded that the multiple regression model in this study is:

$$ERC = 0{,}193 + 0{,}199CSRD + 0{,}010ROA - 0{,}006GEN + 0{,}067GEN*CSRD + 0{,}002GEN*ROA \text{ (ii)}$$

4.3.3. T-Test Result for the 3rd Model

Table 10. T-test Result for 3rd Model

Variable	Regression Coefficent (β)	Sig.
Constanta	0,099	0,161
Independent Variable		
CSRD to ERC	0,321	0,120
Control Variable		
ROA to ERC	0,012	0,002
Moderation Variable		
AGE	0,051	0,195
AGE*CSRD to ERC	-0,136	0,245
AGE*ROA to ERC	-0,001	0,538

As seen in Table 4.9, the value of the coefficient of determination or R-Square where the R-Square value in the first test (not using moderating variables) is 0.005 or 0.5%. This value is smaller than the R-Square value in the testing of research model ii (using the Age diversity variable as moderating), which is 0.044 or 4.4%. So, it can be concluded that the use of Age Diversity can strengthen the influence of Corporate Social Responsibility (CSR) Disclosure on the value of relevance. Based on the results of the tests carried out in table 4.9 above, the data shows a significant value for the moderating variable age of 0.245 with a t count of -1.163. The value is more excellent or not smaller than alpha 0.05. This shows that the third hypothesis is not supported.

Based on the results of the t test for the research model (iii), it can be concluded that the multiple regression model in this study is:

$$ERC = 0{,}099 + 0{,}321SRD + 0{,}012ROA + 0{,}051AGE – 0{,}136AGE*CSRD – 0{,}001AGE*ROA \text{ (iii)}$$

4.3.4. T-Test Result for the 4th Model

Table 11. T-test Result for the 4th Model

Variable	Regression Coefficent (β)	Sig.
Constanta	0,156	0,034
Independent Variable		
CSRD to ERC	0,341	0,104
Control Variable		
ROA to ERC	0,005	0,174
Moderation Variable		
EDU	0,015	0,745
EDU*CSRD to ERC	-0,142	0,259
EDU*ROA to ERC	0,003	0,133

As seen in Table 4.9, the value of the coefficient of determination or R-Square where the R-Square value in the first test (not using moderating variables) is 0.005 or 0.5%. This value is smaller than the R-Square value in the testing of research model ii (using the educational diversity variable as moderating), which is 0.059 or 5.9%. So, it can be concluded that using Educational Diversity can strengthen the effect of Corporate Social Responsibility (CSR) Disclosure on the value of relevance. Based on the results of the tests carried out in table 4.8 above, the data shows a significant value for the educational moderating variable of 0.259 with a t count of -1.130. The value is more excellent or not smaller than alpha 0.05. This shows that the fourth hypothesis is not supported.

Based on the results of the t test for the research model (iv), it can be concluded that the multiple regression model in this study is:

$$ERC = 0{,}156 + 0{,}341SRD + 0{,}005ROA + 0{,}051AGE – 0{,}142CSRD*EDU + 0{,}003ROA\&EDU \text{ (iv)}$$

5. DISCUSSION

5.1. The Effect of Corporate Social Responsibility Disclosure on Relevance Value

Based on the results of statistical testing, the hypothesis shows that Corporate Social Responsibility (CSR) disclosure has no effect on the relevance value with a significance value of 0.273 (more significant than an alpha value of 0.05). That is, statistically, CSRD does not significantly affect the value of relevance. From the results of this study, it can be concluded that the disclosure of corporate social responsibility, carried out through the annual report, may not necessarily increase market reaction and influence investor decision-making. In conclusion, it can be concluded that the disclosure of corporate social responsibility does not have sufficient accounting relevance value to be able to have an influence on investors in investing.

Disclosure of information presented by the company in its annual report has not influenced the company's decision-making, as seen by changes in stock prices. Another reason why this hypothesis cannot be supported is that companies in Indonesia have not been able to disclose corporate social responsibility fully. This can be seen from the observation data where only about 93 companies out of 539 listed on the Indonesia Stock Exchange (IDX) in 2018 – 2020 issued a GRI-based Sustainability Report as a reference for disclosure of international standard corporate social responsibility. This observation means that the information submitted cannot be conveyed optimally, which is in line with research conducted by (Gunardi *et al*., 2021; K. T. Wulandari & Wirajaya, 2014).

In the observations made in this study, the average CSR disclosure of the companies sampled from 2018 to 2020 was around 32% or revealed about 51 points out of 158 points that were used as indicators in this study. Another finding found during this research is the fluctuation in the average corporate social responsibility disclosure, where in 2018, the sample company had an average disclosure value of 31.8%; in 2019, the sample company had an average disclosure value of 34.6%, and in 2020 the sample companies have an average disclosure of 33.2%. It

can be seen from the previous data that is 2018 to 2019, the company's CSR disclosure increased by 2.8%, and from 2019 to 2020, it decreased by 1.4 per cent.

In addition, there are four companies with the highest percentage of corporate social responsibility disclosure starting from PTPP (65%) in 2018, ANJT in 2019 (63%), PTPP in 2019 (63%), WSKT in 2019 (62%), and AGRO in 2018 (62%). The four companies come from sector 1 (Agriculture) for ANJT, sector 6 (Property, Real Estate, and Building Construction) for PTPP and WSKT, and sector 8 (Finance) for AGRO. Another finding found is that these four companies have used the GRI indicator as a reference for their respective corporate social responsibility disclosures since 2018; this shows that when a company uses GRI as an indicator of CSR disclosure, it is likely to have high disclosure quality as well. Another characteristic of these companies is that they are ISO 14001 certified.

As described in previous research conducted by Tangngisalu (2021), the reason for not supporting the hypothesis that there is a relationship between the influence of Corporate Social Responsibility (CSR) Disclosures on the value of relevance is because investors see an environmental performance which is usually disclosed through disclosure of corporate social responsibility through annual reports. In the short term, investors do not necessarily see this as a factor that can be considered when making investments. Another study by Silalahi (2014) states that investors still have a more significant influence on corporate earnings information than on corporate social responsibility performance. This result further strengthens the reason that the first hypothesis is that the influence of Corporate Social Responsibility Disclosure (CSR) on the relevance value is not supported.

5.2. The Effect of Gender Diversity on the Relationship between Disclosure of Corporate Social Responsibility (CSR) and Value Relevance

The results of the second statistical hypothesis test show a relationship between the influence of gender diversity and the relationship between Corporate Social Responsibility (CSR) Disclosures and Relevance Value. This can be seen from the value of R^2 in hypothesis testing in the first research model with the second research model, where in the first research model, the R^2 value is 0.041, while in the second research model, the R^2 value is 0.046. This result shows that there is a strengthening of the influence of Corporate Social Responsibility (CSR) Disclosures on the Relevance Value of 0.005 but not significant seeing the significance value of 0.653 (more remarkable than the alpha value of 0.05). That is, the more balanced the composition of the existing female and male boards of directors will increase the influence of the relationship between Corporate Social Responsibility (CSR) Disclosures and Relevance Value. The reason why this hypothesis is not significant is that many companies in Indonesia do not yet have a female board of directors, where there are 63 companies with a good balance of directors with a composition of about 50% to 60% of the 317 total observations or only about 10% of companies. The emergence of an imbalance in the composition of the board of directors between female and male directors. As many as 153 samples, or almost 50% of the total observation companies, do not have a female board of directors in their company's board of directors.

Another reason why this hypothesis has not been supported is that most companies in Indonesia still have the status of family companies, which is related to the culture of a country which considers that men have the right to occupy a higher structural position than women (Farida, 2019). Various previous studies conducted on countries in several countries in the Continent of Europe, America, and China were conducted by Anazonwu *et al*. (2018); Feng *et al*. (2020); Velte & Stawinoga (2020) show that gender diversity with a good and balanced composition can increase the disclosure of corporate social responsibility and can increase investor reactions so that it has a substantial accounting relevance value. However, in Indonesia, this may not be well received considering that there are still few companies that have a board of directors with a balanced composition, thus further strengthening the reason that the second hypothesis, namely the influence of Gender Diversity on the relationship between Corporate Social Responsibility (CSR) Disclosures and the value of relevance is not supported.

5.3. The Effect of Age Diversity on the Relationship between Corporate Social Responsibility (CSR) Disclosures and Value Relevance

The results of the third statistical hypothesis test show a relationship between the effect of age diversity on the relationship between Corporate Social Responsibility (CSR) Disclosure and Relevance Value. This can be seen from the value of R^2 in hypothesis testing in the first research model with the second research model, where in the first research model, the R^2 value is 0.041, while in the second research model, the R^2 value is 0.044. This shows that there is a strengthening of the influence of Corporate Social Responsibility (CSR) Disclosures on the Relevance Value of 0.003 but not significant seeing the significance value of 0.245 (more remarkable than the alpha value of 0.05). More directors less than 40 years old will increase the influence of the relationship between Corporate Social Responsibility (CSR) Disclosures and Relevance Value. The reason why this hypothesis is not

significant is that many companies in Indonesia do not have a young board of directors (under 40 years old), whereas 30 companies have a good level of diversity of age directors with a percentage of young directors (under 40 years old) by 80% to 10%. In comparison, the other 99 companies are at an alarming level, with a percentage of age diversity around 0% to 20%. This figure is meagre, implying that companies in Indonesia still rely on a more senior generation for directorial positions.

Another reason this hypothesis has not been supported is that the presence of senior directors with an older age of over 40 is considered to be able to make better social policies and strategies. Older directors are more interested in sustainability and want to build better relationships with various communities and environments (Handajani *et al*., 2014). In addition, according to Hassan *et al*. (2020), even the presence of young directors on a young board of directors does not necessarily guarantee that young directors can make a good and maximum contribution, given the strong influence and power of older and senior directors. This further strengthens the reason that the third hypothesis, namely the effect of Age Diversity on the relationship between Corporate Social Responsibility (CSR) Disclosures and the relevance value, is not supported.

5.4. The Effect of Education Diversity on the Relationship between Corporate Social Responsibility (CSR) Disclosures and Value Relevance

The results of the fourth statistical hypothesis test show a relationship between the influence of educational diversity and the relationship between Corporate Social Responsibility (CSR) Disclosure and Relevance Value. This can be seen from the value of R^2 on hypothesis testing in the first research model with the second research model, where in the first research model, the R^2 value is 0.041, while in the second research model, R^2 value is 0.059. This shows a strengthening of the influence of Corporate Social Responsibility (CSR) Disclosures on the Relevance Value of 0.011, but it is not significant seeing the significance value of 0.259 (more incredible than the alpha value of 0.05). That is, the more directors aged with a minimum educational background of Strata-2/master/master, the more influence the relationship between Corporate Social Responsibility (CSR) Disclosures and Relevance Values will have. This hypothesis has not been accepted because very little of the company already has at least one director with a minimum education of Strata-2/master/master. There are 17 companies with the educational diversity level of directors at an excellent level with a percentage of 80% to 100% of the board of directors having a minimum education of Strata-2/master/master, and there are only 107 companies that are at an insufficient level in this study with a percentage of 0% to 100% Percent of the board of directors has a minimum education of Strata-2/master/master.

With high intellectual ability, it is expected to provide performance by making good disclosures that can provide a good signal for the market. This hypothesis is not significant because many companies in Indonesia do not yet have a board of directors with a minimum educational background of Strata-2/master/master. In addition, even though a company has a board of directors with a minimum educational background of Strata-2/master/master, it cannot guarantee the suitability of the field of education taken with the company's conditions (Pajaria *et al*., 2016). According to Pajaria *et al*. (2016), if the educational background of the board of directors is different, but the experience and educational background are not following the needs of the company, it is possible that the board of directors cannot provide opinions, opinions, skills, and experiences that are following the context of the needs of the company, especially those relating to with the disclosure of corporate social responsibility which further strengthens the reason that the third hypothesis, namely the influence of Educational Diversity on the relationship between Disclosure of Corporate Social Responsibility (CSR) and the value of relevance is not supported.

5.5. Effect of Return on Assets (ROA) on Relevance Value

Based on the results of statistical testing of the hypothesis, it shows that Return on Assets (ROA) affects the relevance value with a significance value of 0.000 (smaller than an alpha value of 0.05). That is, statistically, ROA significantly affects the value of relevance. From the results of this study, it can be concluded that the disclosure of information regarding reciprocity of company assets through annual reports significantly affects increasing market reactions and influences investor decision-making. So, it can be concluded that the disclosure of corporate social responsibility does not have sufficient accounting relevance value to affect investors' investments.

The results of this study are also in line with several previous studies Gunadi & Kesuma (2015); Puspitadewi & Rahyuda (2016); Puspitasari (2016). Companies, in general, will strive so that ROA can consistently be increased because the higher the ROA indicates, the more influential the company is in utilizing its assets to generate net profit after tax and with the increasing ROA, the profitability of the company is getting better. The company's ability to manage assets to generate good profits will attract and influence investors to buy shares and invest their funds in a company (Puspitadewi & Rahyuda, 2016). According to Puspitasari (2016), a high ROA number will have the opportunity to provide a high level of stock return in the view of investors, and the market will give a

positive reaction to companies that can produce high ROA figures as well. The same opinion was also conveyed by Watung & Ilat (2016), who explained that if the profit generated by the company increases, then the results obtained by the company are high profits, thus inviting investors to buy and sell shares because most investors in Indonesia still sees the results of good profits from companies in the company's decision-making considerations.

This study's Return on Assets (ROA) variable has a significant positive effect. The positive Return on Assets (ROA) variable indicates an increase in profit compared to the company's assets. This shows that the company is getting better at managing its assets to generate profits which is good information to attract investors to conduct stock transactions (Ghonio and Sukirno, 2017). Based on this research, it can also be seen that most investors in Indonesia are still focused on the company's financial performance, which in this study is proxied by the Return on Assets (ROA) variable compared to non-financial performance, which is represented by the Corporate Social Responsibility (CSR) disclosure variable. Where statistically, the effect of ROA on ERC has a significant positive value, while the influence of Corporate Social Responsibility (CSR) on ERC has a nominal positive value.

6. CONCLUSION AND SUGGESTION

Based on the results of the research and discussion that have been described previously regarding the effect of Corporate Social Responsibility Disclosure on the value of relevance to the diversity of directors (gender, age, and education) as moderating variables in companies listed on the Indonesia Stock Exchange in 2018 - 2020, the following conclusions can be drawn that all hypotheses are not supported. However, with the use of control variables in this study, it can be concluded that, in general, the disclosure of Corporate Social Responsibility has no effect on ERC, so it has no relevant value, but ROA or the rate of return on company assets that influences ERC so that it is considered to have relevance value.

Based on the results of this study, the researcher provides suggestions for further researchers who want to research related phenomena, namely:

1. For further researchers, it is hoped that they can increase the observation time to get better and more significant observations.
2. For further researchers, it is hoped that they can add variables that affect the diversity of directors, which are not only limited to gender, age, and educational background. It can be added with ethnicity, religion, race, and others.
3. For further researchers, it is hoped that they will be able to examine more deeply the educational diversity variable, which is not only limited to the criteria for the education strata of the directors but also to discuss the background of the education focus of the directors.
4. For further researchers, it is hoped that they will be able to discuss not only the overall IDX listed companies in 2018 – 2020 but could do partial testing on each sector and industry so that they can get more in-depth conclusions for each sector and industry.
5. For further researchers, it is hoped that they can use other measurements in viewing the disclosure of corporate social responsibility other than GRI, such as POJK number 51/POJK.03/2017 concerning the Implementation of Sustainable Finance for Financial Services Institutions, Issuers, and Public. Companies or with other criteria that more in line with Indonesian conditions.
6. For the government, it is hoped that it can ensure that existing regulations can be socialized again to the company to increase company awareness in improving company performance so that it can focus more on performance and disclosure of corporate social responsibility.

AUTHORS' DECLARATION

This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support.

AUTHORS' CONTRIBUTIONS

Conceptualization, writing-original draft, data collection, editing – DFW, methodology, formal analysis – RRG and YA, Final Approval and Accountability – L

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International Journal of Business & Economic Studies
Year: 2022, Vol: 4, No:1, pp.45-52
https://doi.org/10.54821/uiecd.1122493

Analysis of the Relationship Between Bitcoin Electricity Consumption and the Global Economic and Political Uncertainty Index (GEPU)

Bitcoin Elektrik Tüketimi ile Küresel Ekonomik Politik Belirsizlik Endeksi (GEPU) Arasındaki İlişkinin Analizi

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Received : 27.05.2022
Revised : 07.06.2022
Accepted : 27.06.2022
Type of Article : Research

Keywords:
Bitcoin,
GEPU Index,
Todo-Yamamoto

Jel Codes:
B23, E63, F43

ABSTRACT

It is possible to define uncertainty as the variability of conditions, the ambiguity and obscurity of statements and events. Uncertainty, for whatever reason, affects the economy in different ways. Uncertainty causes people to be more concerned about their future income. Various estimation and methods have been developed in recent years to calculate the uncertainty, which is equivalent to the concept of uncertainty. These indices, in which economic and political uncertainties are calculated, appear as a form of calculation that also includes political discourses along with financial risk. The aim of this study is to examine the causality relationship between the Global economic political uncertainty index and Bitcoin electricity consumption. For this purpose, the Toda-Yamamoto causality test was applied using data from the period 2011:M7-2022:M1. According to the obtained Toda-Yamamoto causality test findings, Granger causality relationship has been determined both from the global economic-political uncertainty index to Bitcoin electricity consumption and from Bitcoin electricity consumption to the global economic-political uncertainty index.

Anahtar Kelimeler:
Bitcoin,
GEPU Endeksi,
Todo-Yamamoto

Jel Kodları:
B23, E63, F43

ÖZET

Belirsizlik, şartların değişkenliği, ifade ve olayların muğlaklığı ve bilinmezliği olarak tanımlamak mümkündür. Hangi sebeple ortaya çıkarsa çıksın belirsizlik, ekonomiyi farklı yönlerden etkilemektedir. Belirsizlik, insanların gelecekte elde edecekleri gelirleri ile ilgili daha yüksek bir endişeye girmelerine yol açar. Bilinmezlik kavramıyla eşdeğer olan belirsizliği hesaplayabilmek için son yıllarda çeşitli tahminleme ve yöntemler geliştirilmiştir. Ekonomik politik belirsizliklerin hesaplandığı bu endeksler, finansal risk ile birlikte politik söylemlerin de yer aldığı bir hesaplama şekli olarak karşımıza çıkmaktadır. Bu çalışmanın amacı Küresel ekonomik politik belirsizlik endeksi ile Bitcoin elektrik tüketimi arasındaki nedensellik ilişkisini incelemektir. Bu amaçla çalışmada 2011:M7-2022:M1 dönemine ait veriler kullanılarak Toda-Yamamoto nedensellik testi uygulanmıştır. Elde edilen Toda-Yamamoto nedensellik testi bulgularına göre hem küresel ekonomik politik belirsizlik endeksinden Bitcoin elektrik tüketimine doğru hem de Bitcoin elektrik tüketiminden küresel ekonomik politik belirsizlik endeksine doğru Granger nedensellik ilişkisi tespit edilmiştir.

Suggested Citation: Sizer, L. & Yılmaz, Y. (2022). Analysis of the Relationship Between Bitcoin Electricity Consumption and the Global Economic and Political Uncertainty Index (GEPU). *International Journal of Business and Economic Studies*, 4(1), 45-52, Doi: https://doi.org/10.54821/uiecd.1122493

1. INTRODUCTION

Uncertainty is expressed as the variability of conditions and the ambiguity and obscurity of events. In the finance literature, the concept of uncertainty refers to the unknown about how the future of the economy can be affected as a result of sudden changes, such as political or economic crises, in which decision units such as companies or countries are not capable of knowing the possibility of their occurrence in the economic structure (Al-Thaqeb and Algharabali, 2019). In other words, uncertainty; political reasons, internal conflicts, wars or crises in different fields (Bloom, Kose and Terrones, 2013).

Regardless of the reason it arises, uncertainty affects the economy in different ways. Uncertainty causes people to be more concerned about their future income. In order to take precautions against the possible risk of shrinkage in income, people tend to save more instead of consumption (Mody, Ohnsorge and Sandri, 2012). Investors' "wait and see" approach can negatively affect both production and employment. In addition, the increased risk premium in an environment of uncertainty may increase the financing cost of companies' investments (Güney, 2020). In addition, dismissals due to loss of income increase the risk of non-repayment of debts, and accordingly, risk premiums tend to increase and bank loans tend to contract (Schaal, 2017).

Termination estimation and applications can be made to make it possible to measure the obscurity. These indicators are indicators calculated from the point of view of risks and gains information about the global Economic Political education as a basis in the study. GEPU, Baker et al. (2013) It is rescued from economic policy for the USA. This index; applications of references to economics, politics and education are considered to be older than relative aid credit. Later, Baker et al. (2016) article improvement is the policies of economic policies for the USA 11 Europe for the country and the system policies in the newspaper. The authors reported that panel VAR analyzes increased the firm's overall share price volatility in the rating valuation. Later, Davis (2016) makes a global economic policy target.

The GEPU Index consists of the national EPU index based on the GDP weighted average of 21 countries. These countries; Australia, Brazil, Canada, Chile, China, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, Mexico, Netherlands, Russia, South Korea, Spain, Sweden, the United Kingdom, and the United States. Each national EPU index reflects the proportional frequency of its country newspaper articles (www.policyuncertainty.com) containing terms related to economics, policy and uncertainty.

Bitcoin differs from all other coins since the first coin, as it is decentralized and has a structure such as excluding third parties from the system. Bringing technological infrastructures such as Blockchain has made it a system that is spoken all over the world and that affects not only its investors but all parties. Along with being a revolutionary development in the financial world, cryptocurrencies also show themselves as an indispensable innovation in terms of technology (Çağlar and Yavuz, 2021). However, the electrical energy it consumes causes serious discussions.

One way to obtain Bitcoin is to mine crypto with the help of specially manufactured computers. Bitcoin, which has a volatile price, has an increasing momentum in electricity consumption. Electricity consumption depends on the energy efficiency of the equipment used, the bitcoin price trend, and requirements such as cooling-lighting (Kamiya, 2019). All transactions made in the Bitcoin system are recorded on all computers connected to the Bitcoin system (www.dunyaenerji.org). Miners need to verify transactions on the blockchain for bitcoin production and reveal this proof of work. Due to the fact that they have to do these operations with a large number of advanced computers, they consume serious electricity.

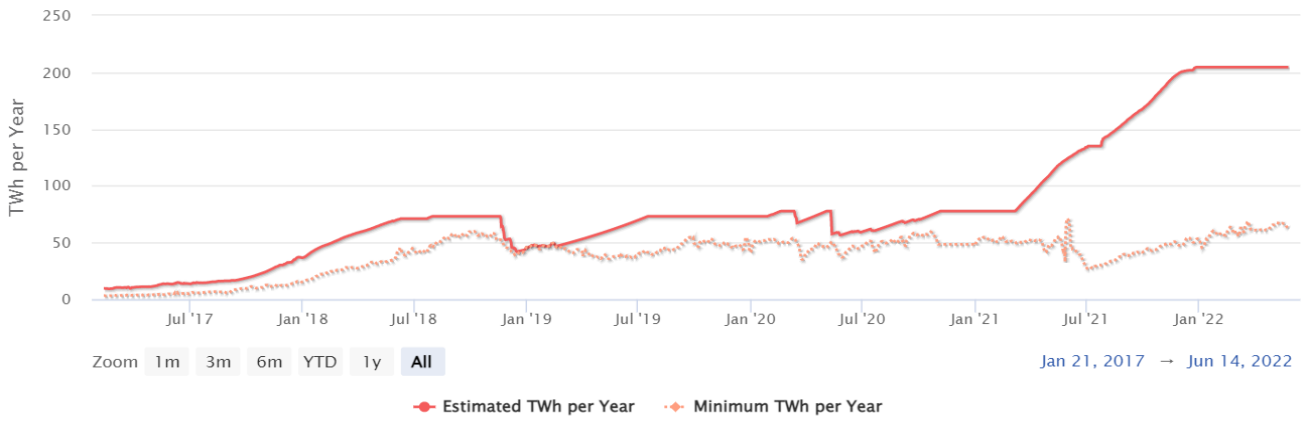

Figure 1. Estimated Bitcoin Electricity Consumption (1 Twh = 1 Billion kWh)

Sources: https://digiconomist.net/bitcoin-energy-consumption

The aim of this study is to analyze the relationship between the GEPU index and Bitcoin electricity consumption. It is aimed to reveal the effect of the GEPU index on the amount of electricity consumed for Bitcoin production. As a result of the literature review, many variables such as GEPU index, stock market indices, exchange rates, inflation, bitcoin price have been the subject of research. However, studies on bitcoin electricity consumption and the GEPU index were limited. In this respect, it is thought that the study will contribute to the literature. After the introduction of the study, a summary of the literature is given in the second part. In the third chapter, the method, data set and analysis results of the study are given. In the conclusion part, the evaluation and interpretation of the findings are given.

2. LITERATURE

Within the scope of this study, many studies related to the global economic political uncertainty index and bitcoin have been examined. It has been observed that studies dealing with the GEPU index, exchange rates, stock market indices, confidence indices and other macro variables have gained intensity. On the other hand, it is noteworthy that studies on energy markets, commodity investments, miner profitability, carbon emissions, bitcoin price and prices of other investment instruments are frequently conducted. This study differs from the literature in order to reveal the relationship between the GEPU index and bitcoin electricity consumption.

Gürsoy, Akkuş, and Doğan (2022) applied a causality test between Bitcoin energy consumption and crypto money price uncertainty index and crypto money policy uncertainty indices in the periods 19.02.2017 and 07.02.2021. According to the findings the uncertainty in the crypto money markets has a causality on Bitcoin energy consumption. Moreover, bitcoin energy consumption is not only linked to crypto markets, but also It was interpreted as being under the influence of government interventions, prohibitions, ill-recognition and developments and movements in other financial markets.

Kılıç, Gürsoy and Ergüney (2021) investigated the relationship between bitcoin electricity consumption and the energy markets of selected countries that lead in bitcoin production. According to the findings, they concluded that there is a bidirectional volatility spread between the CBECI index and the MOEX energy index, and a unidirectional volatility spread between the S&P 500 and SSE energy indices. Jingming et al. (2019), on the other hand, compared the effects of nine types of cryptocurrencies and ten algorithms on mining efficiency and their comparison with Monero mining. According to the results, they stated that the hash algorithm basically determines the mining efficiency.

Çağlar and Yavuz (2021) aimed to reveal the effects of news in newspapers on bitcoin. As a result of the study, they stated that the related news did not have a strong effect on the prediction of bitcoin prices in the artificial neural network. However, among the selected newspapers, they stated that The Wall Street newspaper had a relatively effective effect on the prediction of bitcoin price compared to other newspapers in the same group. Huynh et al., (2022) conducted a study analyzing the relationship between bitcoin energy consumption and market price. They determined that there is a relationship between Bitcoin energy consumption and return and volume.

Sadeghzadeh Emsen & Aksu (2020) tested whether there is a symmetrical and asymmetrical relationship between the BIST100 index and the uncertainty index in their study. While a symmetrical relationship could not be determined as a result of the analyzes, they revealed that there were asymmetrical relationships between the two

variables. Gürsoy and Kılıç (2021), on the other hand, investigated the effect of economic and political uncertainty in global markets on financial markets in Turkey. GEPU index, Turkey 5-year CDS premiums and BIST banking index variables were tested with DCC-GARCH model. It has been found that there is a strong two-way volatility interaction between the GEPU index, the CDS premium, and the BIST banking index. Gürsoy (2021) tested the relationship between the GEPU index and exchange rate, inflation and BIST100 variables with the Hatemi-J Asymmetric Causality test. A positive causality effect was obtained from the GEPU index to the exchange rates. Korkmaz and Güngör (2018) aimed to reveal the effect of the GEPU index on the returns of companies traded in the Turkish stock market by analyzing them with volatility models. As a result of the analyzes, they concluded that the GEPU index had a significant and positive effect on the volatility of company stock returns in the 1997-2018 period.

Güney (2020) used the boundary test approach to analyze the existence of the effect of the GEPU index on the volatility of selected exchange rates. They found that the EPU index calculated for the USA had an effect on the dollar exchange rate volatility in the long run, but the EPU index calculated for Europe had no effect on the Euro exchange rate volatility.

3. DATA

The Global Economic-Political Uncertainty (www.policyuncertainty.com) and Bitcoin electricity consumption (BTCTWH) variables used in the analysis were obtained from (https://digiconomist.net). Data belonging to the period 2011:M7-2022:M1 were used in the study. In addition, the natural logarithms of the variables used were taken and included in the analysis.

4. ECONOMETRIC METHODOLOGY

VAR (Vector Autoregressive Models) analysis is an analysis frequently used by researchers and practitioners to present econometric results and to offer policy recommendations. If the variables have a unit root or if there is cointegration between the variables, hypothesis tests are not valid in these models. The series that are stationary are normally analyzed with VAR, and then the F statistic in the Granger test is used. However, Toda-Yamamoto (TY, 1995) showed that if there is a cointegration relationship between the variables, the F-statistic may lose its validity by not complying with the standard distribution. TY (1995) stated that when examining an economic theory or establishing an econometric model, even if the relevant variables contain unit roots, VAR analysis can be done by using the level values of these variables, and the Wald test can be used here. TY (1995) states in his study that if there is a cointegration relationship between the variables, there will be an error correction system (ECM). However, in most applications, the degree of integration of the variables, whether they are cointegrated and their stationarity properties are not known beforehand. As a result, unit root analysis is performed first for Granger causality, and then the cointegration relationship is investigated. Then, it examines the causal relationships with the help of VAR analysis. TY (1995) states that these preliminary tests can give difficult and misleading results. In order to overcome all these problems, TY(1995), (k+dmax). It proposes the creation of a first-order VAR model. Here, k indicates the optimal lag length that meets the stability conditions, and dmax indicates the maximum integration degree of the relevant series in the model (Mert & Çağlar, 2019: 344-345). The TY(1995) test exhibits χ^2 asymptotic distribution with lag length k. For the TY(1995) test, k and dmax must be determined first. The success of causality analysis depends on the correct determination of these two indicators. TY(1995) causality test equations for BTCTWH and GEPU variables are given below:

$$BTCTWH_t = a_0 + \sum_{i=1}^{k+dmax} \varphi_i BTCTWH_{t-i} + \sum_{i=1}^{k+dmax} \gamma_i GEPU_{t-i} + \varepsilon_{1t} \quad (1)$$

$$GEPU_t = b_0 + \sum_{i=1}^{k+dmax} \psi_i GEPU_{t-i} + \sum_{i=1}^{k+dmax} \gamma_i BTCTWH_{t-i} + \varepsilon_{2t} \quad (2)$$

In equations (1) and (2); It is assumed that the error terms ε_{1t} ve ε_{2t} exhibit clean sequence processes and there is no autocorrelation.

$$H_0: \gamma_i = 0$$
$$H_1: \gamma_i \neq 0 \qquad (3)$$

The hypothesis (3) established for the causality relationship of the model numbered (1) above is given in the equation. The rejection of the null hypothesis indicates that there is a Granger causality relationship from the $GEPU_t$ variable to the $BTCTWH_t$ variable. These hypotheses are tested with the help of the Wald test, which fits the χ^2 distribution with k degrees of freedom (Toda & Yamamoto, 1995: 228-229).

5. FINDINGS

Before proceeding to the Toda-Yamamoto causality results, it is necessary to determine to what degree the variables are integrated. For this, ADF and PP unit root tests, which are traditional unit root tests frequently used in the literature, were used. The unit root test results obtained are given in Tables 1 and 2.

Table 1. ADF Unit Root Test Results

	Intercept		Intercept and Trend	
Variables	**(T)Statistic**	**5% Critical Value**	**(T)Statistic**	**5% Critical Value**
BTCTWH	-1.347 (1)	-2.884	-1.371 (2)	-3.446
GEPU	-2.166 (1)	-2.884	-4.070** (0)	-3.445
ΔBTCTWH	-4.788** (0)	-2.884	-4.891** (0)	-3.446
ΔGEPU	-14.675** (0)	-2.884	-14.640** (0)	-3.446

Note: ** indicates significant at the 5% significance level. Values in parentheses represent the appropriate lag length determined according to Schwarz (SIC) information criteria.

Table 2. PP Unit Root Test Results

	Intercept		Intercept and Trend	
	(T)Statistic	**5% Critical Value**	**(T)Statistic**	**5% Critical Value**
BTCTWH	-2.222 (8)	-2.884	-1.202 (8)	-3.445
GEPU	-2,437 (3)	-2.884	-3.855** (1)	-3.445
ΔBTCTWH	-4.988** (3)	-2.884	-5.152 **(3)	-3.446
ΔGEPU	-18.880** (28)	-2.884	-19.795** (30)	-3.446

Note: :** indicates significant at the 5% significance level. Values in parentheses represent the appropriate Bandwidth delay length determined according to the Newey-West Bandwidth criteria.

According to the results obtained in Table 1, 2, BTCTWH variable was not stationary at the level in both fixed and fixed and trended model according to ADF and PP unit root tests. However, it is seen that the series becomes stationary after taking the 1st difference. According to both ADF and PP unit root tests, while the GEPU variable is not stationary in the fixed model, it appears to be stationary in the level values in the fixed and trend model. Therefore, the maximum lag length for the VAR model is calculated as $d_{max} = 1$

In addition, the appropriate lag length for the VAR model was decided by looking at the Likelihood Ratio (LR), Akaike (AIC), Schwarz (SC) Hannan-Quin (HQ) information criteria. The results obtained according to these information criteria are given in the table below.

Table 3. Determining the Appropriate Lag Length for the VAR Model

Lag	LR	AIC	SC	HQ
1	NA	4.790207	4.836915	4.809174
2	993.0281	-3.703153	-3.563029	-3.646253
3	99.78086*	-4.511197*	-4.277657*	-4.416363*
4	4.153352	-4.481053	-4.154097	-4.348287
5	6.207994	-4.470263	-4.049891	-4.299563

* Indicates the optimum lag length.

In Table 3, the lowest value according to all information criteria shows that the model with 3 lags is suitable. In other words, the lag length to be used in the model was determined as k=3. After determining the lag length, the Autocorrelation LM test was performed in order to decide whether there is an autocorrelation problem according to the determined lag length. As can be seen from Table 4, there is no autocorrelation problem.

Table 4. Autocorrelation LM Test Results

Lag	LM-Statistic	Prob.
1	4.820478	0.3062
2	7.815813	0.0986
3	4.087377	0.3943
4	1.164642	0.8839
5	2.469323	0.6501

In addition, considering the selected lag length, it should be tested whether the error terms of the VAR model contain autocorrelation problems. The autocorrelation problem may lead to deviations in the estimated parameters, resulting in erroneous findings. For this purpose, the inverse roots of the error term of the predicted model can be examined. If the error term is not autocorrelated, its inverse roots must be less than 1. The results for the inverse roots of the error terms are given in the table below.

Table 5. Inverse Roots of Error Terms

Root	Modulus
0.992473	0.992473
0.852633	0.852633
0.702922	0.702922
-0.216035	0.216035
0.992473	0.992473

Table 5 indicate that the inverse roots of the error terms were less than 1, so it was concluded that the model was dynamically consistent. Therefore, to perform the Toda-Yamamoto causality test, causality analysis can be performed since no problems were detected in the pre-tests.

Then, according to the unit root test and VAR lag length results, the $p + d_{max}$ value required for the Toda-Yamamoto causality test is 4. The results of the Toda-Yamamoto causality test obtained by considering these situations are given in Table 6 below.

Table 6. Toda-Yamamoto Causality Results

Direction of Causality	Lag Lenght	χ^2	Prob.
GEPU → BTCTWH	(k=3)+($d_{max} = 1$) = 4	8.243	0.040
BTCTWH → GEPU	(k=3)+($d_{max} = 1$) = 4	8.240	0.041

Table 6 shows that since the probability value of the calculated χ^2test statistical value is 0.04, the null hypothesis is rejected. In other words, there is a Granger causality relationship from global economic policy uncertainty to Bitcoin electricity consumption at the 5% significance level. Similarly, since the probability value of the χ^2test statistical value calculated from Bitcoin electricity consumption to global economic policy uncertainty is 0.04, the null hypothesis is rejected. In other words, there is a Granger causality relationship from Bitcoin electricity consumption to global economic policy uncertainty at the 5% significance level. Therefore, there is a two-way relationship between the variables.

6. RESULTS

Cryptocurrencies have become an investment tool that is frequently mentioned all over the world in the last ten years. Being the first crypto money to emerge and having the power to dominate the market has brought bitcoin to a very different position. Although bitcoin prices are the main talk among investors, bitcoin electricity consumption has a dimension that cannot be ignored. Uncertainty, on the other hand, causes investors to delay their investment decisions due to unpredictable conditions about the future, causing people to suffer higher future anxiety. Some indices have been developed to estimate uncertainty and make it relatively known. One of the most common of these indices is the global economic and political uncertainty index.

In this study, which examines the causal relationship between global economic political uncertainty and Bitcoin electricity consumption, data from the period 2011:M7-2022:M1 are used. Toda-Yamamoto causality analysis was applied to investigate the causal relationship between the variables, as it allows both the variables to be integrated to different degrees and to perform the analysis without the need for any cointegration analysis. According to the Toda-Yamamoto causality result made after obtaining the appropriate lag length, a Granger causality relationship was determined both from the global economic political uncertainty index to bitcoin electricity consumption and from bitcoin electricity consumption to the global economic political uncertainty index at the 5% significance level.

The determination of both variables as the cause of each other clearly shows that one global market affects another market. This situation supports that investors have to follow the financial markets on a global basis, not just the financial instrument they will invest in, while making their investment decisions.

AUTHORS' DECLARATION

This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support.

AUTHORS' CONTRIBUTIONS

Conceptualization, writing-original draft, data collection, editing – LS, methodology, formal analysis – YY, Final Approval and Accountability – LS and YY

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International Journal of Business & Economic Studies
Year: 2022, Vol: 4, No:1, pp.53-64
https://doi.org/10.54821/uiecd.1115243

Impact of Economic Growth and Capital on Financial Development: Analysis of the Role of Financial Globalization in the Case of Turkey with ARDL Bounds Test Approach

Ekonomik Büyüme ve Sermayenin Finansal Gelişme Üzerindeki Etkisi: Türkiye Örneğinde Finansal Küreselleşmenin Rolünün ARDL Sınır Testi Yaklaşımı İle Analizi

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Received : 11.05.2022
Revised : 02.06.2022
Accepted : 27.06.2022
Type of Article : Research

Keywords:

Financial Globalization,

Financial Development,

ARDL Bounds Test Approach

Jel Codes:
C32 E44 F65

ABSTRACT

The aim of this study is to examine the impact of economic growth, capital and financial globalization on financial development for the period 1990-2018 in the case of Turkey. In the analysis, credits to the private sector were used as an indicator of financial development. The measure of globalization is based on the KOF financial globalization index. The long-run relationship between the series was revealed with the ARDL Bounds Test approach and a long-run prediction was made. As a result of the analysis, the effect of all variables on financial development was found to be positive and statistically significant. Long-run estimating was also made with FMOLS, DOLS and CCR models to demonstrate the reliability of the ARDL model. In all models, it was found that the estimation results were consistent with each other. In the latest Toda Yamamoto causality analysis, the bidirectional causality relationship between financial development and GDP and capital was identified. A unidirectional causality relationship from financial globalization to financial development has been found. Therefore, it has been concluded that financial globalization is an important factor in the growth and development process of the financial system in Turkey.

Anahtar Kelimeler:

Finansal Küreselleşme,

Finansal Gelişme,

ARDL Sınır Testi Yaklaşımı

Jel Kodları:
C32 E44 F65

ÖZET

Bu çalışmanın amacı, Türkiye örneğinde 1990-2018 dönemi için ekonomik büyüme, sermaye ve finansal küreselleşmenin finansal gelişme üzerindeki etkisinin incelenmesidir. Analizde, finansal gelişmenin göstergesi olarak özel sektöre verilen krediler kullanılmıştır. Küreselleşmenin ölçütü olarak ise KOF finansal küreselleşme indeksi esas alınmıştır. Seriler arasındaki uzun dönemli ilişki ARDL Sınır Testi yaklaşımı ile ortaya konularak uzun dönem tahmini yapılmıştır. Analiz sonucunda tüm değişkenlerin finansal gelişme üzerindeki etkisi pozitif ve istatistiksel olarak anlamlı bulunmuştur. ARDL modelinin güvenirliliğini ortaya koymak için ayrıca FMOLS, DOLS ve CCR modelleri ile uzun dönem tahmini yapılmıştır. Tüm modellerde tahmin sonuçlarının birbirleri ile tutarlı olduğu bulgusuna ulaşılmıştır. Son aşamada yapılan Toda Yamamoto nedensellik analizinde finansal gelişme ile GDP ve sermaye arasında çift yönlü bir nedensellik ilişkisi tespit edilmiştir. Finansal küreselleşmeden finansal gelişmeye doğru tek yönlü nedensellik ilişkisi bulgusuna ulaşılmıştır. Dolayısıyla finansal küreselleşmenin Türkiye'deki finansal sistemin büyüme ve gelişim sürecinde önemli bir faktör olduğu sonucuna ulaşılmıştır.

Suggested Citation: Altay Topcu, B. & Sumerli Sarıgül, S. (2022). Impact of Economic Growth and Capital on Financial Development: Analysis of the Role of Financial Globalization in the Case of Turkey with ARDL Bounds Test Approach. *International Journal of Business and Economic Studies*, 4(1), 53-64, Doi: https://doi.org/10.54821/uiecd.1115243

1. INTRODUCTION

Today, as the process of globalization accelerates, the interaction between people, societies and countries has increased and accelerated considerably. The process, which began to take shape about two centuries ago, has offered great improvements in communication, transportation and finance in recent years due to the rapidly developing technology. The network of economic globalization covering financial transactions is called financial globalization. Since the 1970s, the collapse of the Bretton Woods system has paved the way for financial globalization. Changing the system and switching to a free exchange rate system led to the formation of the international foreign exchange market in a very short time. The effective functioning of the foreign exchange market with the developing technology has opened other capital markets to global transactions (Ganiev, 2014: 119).

The positive relationship between the financial system and the entire economy is the most important determinant of performance in a stable and well-functioning economy. The financial system fulfills efficient evaluation of savings between households, businesses, the public and foreigners, allocation of funds to appropriate investment areas, ensuring price formation mechanism in doing so, increasing liquidity and reducing information costs. Financial development can affect economic growth as the economy becomes increasingly financialized and the size, importance and functions of factors such as intermediaries, instruments, fund supply and claimants, regulation, supervision, surveillance systems and mechanisms within the financial system increase (Durusu Ciftci, et al. 2017: 291).

An advanced financial system can trigger economic growth, as well as globalization trends can positively affect economic growth and financial development. The generally accepted approach to this process is that the process of globalization has given an impetus to economic growth by increasing participation in international economic activities. This view, supported by the IMF and the World Bank, also known as the Washington Consensus, is generally supported by the 2016 Washington Consensus. it is argued that globalization increases national and employment by increasing free trade, technological development, capital flows and savings mobility reduces transaction and capital costs, and therefore reduces the poverty level (Helhel, 2017: 159).

Regarding the positive impact of globalization on financial development, Baldwin and Forslid (1996) argue that as a result of competition between foreign banks and local banks entering the market with globalization, domestic interest rates are positively affected in favor of investors, thus facilitating access to credit. However, it is also stated that globalization has a negative effect on financial development. Prasad et al. (2005) argue that globalization is the cause of currency-based financial crises, especially in developing countries. He argues that some developing countries can easily find foreign debt due to financial globalization, but these debts have reached an unsustainable level and economic crises are frequently experienced in these countries due to external shocks.

Financial development promotes economic growth and development, as it has an impact on savings decisions and investments in a country (Levine, 2005; Ang, 2008). As a result, it is important to determine what determines financial development. There are numerous studies in the literature that explore the relationship between financial development and economic growth. However, the number of studies investigating the impact of globalization on financial development is few. In this respect, it is thought that determining the impact of financial globalization on financial development by using 1990-2018 data for the Turkish economy can contribute to the literature. The study consists of five parts. Following the introduction, the second part included a literature review. In the third part, the model, data and methodology are emphasized. In the fourth part, the results of the analysis were evaluated. The study was completed with the conclusion and discussion section.

2. LITERATURE REVIEW

In this part of the study, the literature is examined in two parts. The first part includes studies exploring the relationship between financial development and economic growth. In the second part, studies examining the link between financial globalization and financial development are summarized.

2.1. The Link Between Financial Development and Economic Growth

The first study on the relationship between financial development and economic growth was carried out by Schumpeter (1911). Schumpeter (1911) states in his study that the banking system is a very important factor for economic growth due to its role in the allocation of savings, promoting innovation and financing productive of investments. In addition, it states that a financial system with a well-functioning lending process will accelerate economic growth by supporting R&D and innovation activities. In the following years, the view that financial

development positively affected economic growth was supported by the study Goldsmith (1959), McKinnon (1973), Bencivenga and Smith (1991), King and Levine (1993). Murinde and Eng (1994) examined the relationship between financial development and economic growth in Singapore in their work covering the period 1979-1990. To explain this relationship, they used three groups of financial variables: monetary sizes, monetary rates and monetary variables. The results of the analysis showed that monetary variables positively affected real economic growth. In contrast, it was determined that national income had no effect on financial variables. Demetriades and Hussein (1996) found a bidirectional causality relationship between financial development and economic growth.

Arestis and Demetriades (1997) examined the impact of financial development on economic growth in the case of the United States and Germany. The results of the analysis showed that the stock market capitalization used as an indicator of financial development in Germany has an indirect effect on economic growth and has a direct and positive effect in the United States. Shan, Morris and Sun (2001) and Al-Yousif (2002) included international comparisons in their study investigating the relationship between economic growth and financial development and concluded that the relationship between financial development and economic growth is the bidirectional causality relationship.

Calderon and Liu (2003) examined the causality relationship between financial development and economic growth for 109 developing countries and the period 1960-1994. In this study using the Geweke decomposition test, they found that financial development in all countries leads to economic growth. In addition, in some countries, the bidirectional causality relationship has been established between financial development and economic growth. In their studies, Muslimov and Aras (2002) tested the relationship between capital market development and economic growth in OECD countries in the period 1982-2000. GDP per capita was used as a measure of economic growth. As a measure of financial development, the ratio of capital market capitalization to GDP and the ratio of capital market liquidity to GDP were used. According to the results of the study using panel data analysis; the development of the capital market has been identified as the reason for economic growth.

Shan and Morris (2002) examined the relationship between financial development and economic growth in 19 OECD countries, China and South Korea for the period 1985-1998. The real national income growth rate has been used to represent economic growth. In addition, two criteria for financial development were used. The first is the ratio of loans to national income, and the second is the difference between borrowing and lending interest rates. The study yielded different results. In a small number of countries, financial development was found to lead to economic growth; in some countries, it has been found that mutual interaction or economic growth supports financial development. But the overall result is that financial development and economic growth occur at the same time and do not cause each other.

Rincon (2007) examined the relationship between financial globalization and economic growth in 43 countries with data covering the years 1984-2003; for Bolivia, Colombia, Costa Rica, Ecuador, Peru and Venezuela, it has been concluded that financial globalization promotes economic growth. In their study, Schularick and Steger (2010) compare today's financial globalization with the financial globalization of 1880-1914 and state that it has an impact on economic growth as opposed to the previous one and the present. As a reason for this, they state that international flows between 1880 and 1914 consisted of net capital movements towards investments at a high rate.

Egbetunde and Akinlo (2015) concluded that there is a long-run relationship between financial globalization and economic growth as a result of panel cointegration and Multivariate ECM tests for sub-Saharan African countries between 1980 and 2005. A long-run relationship was found for all countries in the analysis. In addition, a unidirectional causality relationship was found from financial development to economic growth for Central African Rep., Congo Rep., Gabon and Nigeria, vice versa causality for Zambia, and bidirectional causality for Kenya, Chad, South Africa, Sierra Leone and Swaziland. Turkoglu (2016) found a bidirectional causality relationship between financial development and economic growth in Turkey for the period 1960-2013. Ofori Abebrese et al. (2017), with data covering the period 1970-2013, found a unidirectional causality relationship from domestic credit to the private sector to growth according to Granger causality test results in Ghana's case.

Bhanumurth and Kumawat (2018) conducted panel VAR and panel causality tests on South Asian countries; for India, Pakistan, Maldives and Nepal, they have identified a relationship from economic growth to financial globalization, while for Sri Lanka and Bhutan they have concluded that there is a meaningful relationship from financial globalization to economic growth. For Bangladesh, they found that foreign capital inflows cause indirect economic growth due to their impact on the domestic market. Pata and Agca (2018) investigated the relations between financial development and economic growth for Turkey in the period 1982-2016. According to the ARDL model results, it has been determined that the increase in financial development positively affects

economic growth both in the short and long run. It has been found that there is unidirectional causality from financial development to economic growth.

2.2. The Link Between Financial Development and Financial Globalization

Law and Demetriades (2006) investigated the impact of free foreign trade and foreign capital inflows on financial development in 43 developing countries using data from the period 1980-2001. Free foreign trade has been found to contribute more to financial development, especially in middle-income developing countries where institutionalization is relatively good. Baltagi et al. (2009), according to the results of dynamic panel data analysis using data from developed and developing countries, found that trade and financial openness positively and statistically significantly affected the development of the banking sector.

Falahaty and Law (2012) examined the relationship between globalization and financial development in MENA countries for the period 1991-2007. As a result of the analysis, it was determined that globalization has an impact on corporate quality, which triggers financial development and economic growth. Garcia (2012) investigated the impact of financial globalization on financial development in 26 transition economies for the period 1995-2008. In general, it has been found that financial globalization has positively affected financial development. Yüce Akinci et al. (2013), the relationship between economic globalization and financial freedoms was analyzed in 1995-2012 using panel data analysis for developed, developing and underdeveloped countries. The results of the analysis revealed that economic globalization will increase financial freedoms and the phenomenon of increasing globalization will also increase financial freedoms.

For the period 1989-2012, Kandil et al. (2015) analyzed the impact of globalization on financial development and economic growth in 32 developed and developing countries. As a result of the analysis, it was determined that globalization has a positive effect on financial development and growth. Nasreen and Pervez (2017) explored the relationship between financial development and financial liberalization in middle-income economies. They found a bidirectional causality relationship between financial development and financial liberalization.

Helhel (2017) examined the relationship between globalization and financial development in the case of BRICS countries and Turkey for the period 2002-2015. As a result of the analysis, it has been revealed that globalization has a positive and statistically significant effect on domestic credit to the private sector, the return rate of shares and transaction value. Muye and Muye (2017) examined the relationship between globalization, institutionalization and financial development for BRICS and MINT countries in 1984-2013. According to Granger causality test results, it was determined that there is unidirectional causality from globalization to institutionalization in BRICS and MINT countries, and unidirectional causality from institutionalization to banking-based financial development. In addition, it has been concluded that there is a causality relationship from globalization to capital market-based financial development.

Balcilar et al. (2019) investigated in 36 developing countries whether globalization affects financial development by creating opportunities for institutional reforms. The results showed that all globalization initiatives greatly improve financial development. Rathore and Prajapati (2019) analyzed the impact of financial globalization on the Indian financial market. The results showed that financial globalization has positively affected India's financial markets.

3. MODEL, DATA AND METHODOLOGY

In this study, the impact of economic growth, capital and financial globalization on financial development in Turkey during the period 1990-2018 was investigated. The data and data definitions are shown in Table 1.

Table 1. Definition of Variables

Variables	Source	Symbol
Domestic credit to private sector by banks (% of GDP)	World Bank-WDI-2021	FD
GDP (constant 2015 US$)	World Bank-WDI-2021	GDP
Gross fixed capital formation (% of GDP)		GFC
Financial globalization index	KOF Swiss Economic Institute-2021	FG

The model estimated by taking the natural logarithm of all variables is presented below:

$$lnFD_{it} = \alpha + b_1 lnGDP_{it} + b_2 lnGFC_{it} + b_3 lnFG_{it} + \varepsilon_{it} \quad (1)$$

ADF and PP unit root tests, which are traditional unit root tests, were used stationarity of the series in the study to determine. In addition, the stationarity of the series was detected with the Vogelsang-Perron unit root test, which allowed a single structural break. Later, the cointegration relationship was examined with the ARDL bounds test approach. Long-run coefficients of variables were estimated with ARDL, FMOLS, DOLS and CCR Models. In the final stage of the study, the causality relationship between the variables was investigated with the Toda-Yamomoto approach.

The ADF test, developed by Dickey and Fuller (1981), includes regression of its own delayed value and differences of the series whose stationarity is to be investigated, and regression is shown in equation 2:

$$\Delta Y_t = \alpha + \beta_t + \delta Y_{(t-1)} + \vartheta \sum \Delta Y_{(t-1)} + \varepsilon_t \quad (2)$$

In equation 2, Δ, shows the difference processor, ε_t, error term. In the unit root test, the lag length for each series. The acceptance of the null hypothesis in the ADF test indicates that the series contained unit roots at the level value. If the δ coefficient is statistically significant, the null hypothesis is rejected and the series is considered stationary (Kızılgol, 2006: 57; Sumerli Sarigul and Altay Topcu, 2021: 49).

PP test developed by Phillips and Peron (1988) addresses deficiencies in the ADF test. This test eliminates the problem of serial correlation and varying variance that occurs in errors in the ADF test. PP test can be expressed as in equation 3.

$$\Delta Y_t = \alpha Y_{t-1} + x_t' \delta + \varepsilon_t \quad (3)$$

In equation 3, $\alpha = \rho - 1$, x_t means "constant" or "constant" and "trend". In PP test, the null hypothesis indicates that there is a unit root (Caglayan and Sacaklı, 2006: 124).

Traditional unit root tests are inadequate because they do not take into account the political and economic developments in the countries and the periods of structural break that may arise. Unit root test statistics developed by Perron and Vogelsang (1992) and Vogelsang and Perron (1998), which eliminate this deficiency and allow for a single structural break, can be obtained with the help of two different models: Total Outlier Value (AO) and Innovation Outlier Value (IO). The AO model allows for a change in the slope of the trend function. In this model, structural changes are assumed to occur suddenly. The IO Model, on the other hand, allows only constant change in the trend function. In this model, it is assumed that the change occurs gradually (Cetin and Saygın, 2019: 323). In the study, the AO model was preferred to determine the stationary characteristics of the variables. In this context, the unit root test is carried out in a two-step method:

$$y_t = \mu + \beta_t + yDT_t^* + \tilde{y}_t \quad (4)$$

In the first stage, the series is de-trended. Equation 4, $\tilde{y}_t$ trend-free series. To test the change in the slope coefficient, equation 5 is used in the second stage:

$$\tilde{y}_t = \alpha \tilde{y}_{t-1} + \sum_{i=1}^{K} ci \Delta y_{t-1} + e_t \quad (5)$$

If the t-statistics are greater than the critical value as an absolute value, the null hypothesis that accepts the existence of the unit root is rejected.

Cointegration tests developed by Engle and Granger (1987), Johansen (1988), Johansen and Juselius (1990) are commonly applied to determine the cointegration relationship between the series. Some limitations in these tests led to the development of the bounds test method based on the ARDL model (Kocak, 2014, 63). In this method, both a long-run relationship and a short-run relationship between variables can be tested, regardless of whether the variables are I(0) or I(1) (Pesaran et al., 2001). According to Narayan and Narayan (2006) and Shahbaz et al., (2012), results based on the ARDL method are more effective than the test results of classical cointegration methods and work better in small samples.

The working-adapted form of the ARDL model is as shown in equation 6:

$$InFD_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta InFD_{t-i} + \sum_{i=0}^{q} \alpha_{2i} \Delta lnGDP_{t-i} + \sum_{i=0}^{q} \alpha_{3i} \Delta lnGFC_{t-i} + \sum_{i=0}^{q} \alpha_{4i} \Delta lnFG_{t-i} + \beta_1 InFD_{t-1} + \beta_2 lnGDP_{t-1} + \beta_3 lnGFC_{t-1} + \beta_4 lnFG_{t-1} + u_t \quad (6)$$

Here, α_0 is the constant term, Δ is the first difference operator of the variables, u_t is the error term. In determining the lag length, information criteria such as Akaike (AIC) and Schwarz-Bayesian (SBC) are taken into account and the lag length that provides the smallest critical value is selected. The null hypothesis of cointegration, $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ against, the alternative hypothesis is $H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$. Pesaran et al.

(2001) recommend F-test to test the cointegration relationship between series after determining the lag length. F-statistics calculated when making the decision to cointegration are compared with the upper and lower critical limit values. If the F-statistics exceed the upper bound value, a conclusion is reached that there is cointegration between the variables. If the F-statistics fall below the lower limit value, the null hypothesis of cointegration is rejected and it is decided that there is no cointegration between the variables. If F-statistics are located between these two bound values, this means that there is no judgment on the existence of cointegration. In addition, diagnostic tests are performed to check the robustness and suitability of the ARDL model. These are tests that the normality of error terms, autocoration and varying variance tests. If the cointegration relationship between the variables is determined according to the bounds test result, ARDL is estimated to determine the long and short-run relationships of the variables.

Toda and Yamamoto's (1995) causality analysis investigates causality relationships between variables using the level values of series, regardless of the level of stationary of the series. Toda and Yamamoto's (1995) causality test preferred in our study is an improved form of Granger causality testing for non-stationary but cointegrated series. In this method, in the first stage, the most appropriate VAR lag length determined for the series, the max. The new VAR model, which is created by adding delays as much as the degrees of cointegration, is estimated. In our study, the most appropriate lag length was determined as 4, and since all series had a degree of cointegration of I(1), the VAR(5) model was estimated in this method. In the second stage of the method, the Wald statistics were calculated.

4. ANALYSIS RESULTS

Table 2 provides ADF and PP unit root test results for the constant model.

Table 2. ADF and PP Unit Root Test Results

Tests	Variables			
	lnFD	lnGDP	lnGFC	lnFG
ADF	0.005	0.560	-1.704	-2.555
	(0.951)	(0.985)	(0.418)	(0.114)
	ΔlnFD	ΔlnGDP	ΔlnGFC	ΔlnFG
ADF	-3.935*	-5.399*	-5.614*	-4.754*
	(0.005)	(0.000)	(0.000)	(0.000)
PP	-0.131	1.863	-1.704	-2.625***
	(0.936)	(0.999)	(0.418)	(0.100)
	ΔlnFD	ΔlnGDP	ΔlnGFC	ΔlnFG
PP	-3.867*	-5.399*	-5.614*	-4.752*
	(0.006)	(0.000)	(0.000)	(0.000)

Note: Δ the mark indicates the first differences of the series.
* and *** show the significance level of 1% and 10%, respectively.

As seen in Table 2, according to all test results, while the FD, GDP and GFC variables contain unit root at the level value, they become stationary in the first difference. While the FG variable is stationary at the first difference according to the ADF test result, it is stationary at both the level value and the first difference according to the PP test result.

The Vogelsang-Perron single structural break unit root test results for the constant model are presented in Table 3. According to the results of Table 3, all variables became stationary at the first difference. These findings are similar to the ADF and PP test results.

Table 3. Vogelsang-Perron Test Results

Model	Additive Outlier	
Variables	t-statistics	Break Time
lnFD	-2.469	2004
	(0.910)	
lnGDP	-1.530	2000
	(> 0.99)	
lnGFC	-3.120	2003
	(0.614)	
lnFG	-3.488	2000
	(0.393)	
Variables		
ΔlnFD	-4.676**	2003
	(0.026)	
ΔlnGDP	-6.502	2009
	(< 0.01)*	
ΔlnGFC	-6.548	1999
	(< 0.01)*	
ΔlnFG	-5.384*	2017
	(< 0.01)	

Note: Δ the mark indicates the first differences of the series.
* and ** show the significance level of 1% and 5%, respectively

After the unit root analysis, it was started to determine the appropriate lag length with the help of the VAR model. As can be seen from Table 4, the lag length is determined as 4 according to LR, FPE, AIC and HQ criteria. The appropriate lag length obtained was used in the cointegration relationship and long-run estimation.

Table 4. VAR Model Determination of Appropriate Lag Length

Lag Length	LR	FPE	AIC	SIC	HQ
0	NA	2.47e-07	-3.860	-3.665	-3.806
1	153.545	4.21e-10	-10.258	-9.283*	-9.987
2	16.877	5.91e-10	-10.032	-8.277	-9.546
3	9.011	1.38e-09	-9.503	-6.968	-8.800
4	26.455*	3.81e-10*	-11.530*	-8.215	-10.611*

Note: * indicates optimal lag length.

ARDL (3, 4, 4, 4) model results showing the cointegration relationship between variables are shown in Table 5. The fact that the ECT_{t-1} the coefficient is negative and meaningful at the 1% significance level the indicating that there is a short-run relationship between the variables. In addition, the F-statistic value (8.725) is statistically meaningful at the 1% significance level. Since this value is higher than the upper critical value at the 1% significance level, it has been found that there is a long-run relationship between the variables.

Table 5. ARDL Cointegration Results

Bounds F-test		
Model	F(lnFD/lnGDP, lnGFC, lnFG)	
Optimal lag structure	[3, 4, 4, 4]	
ECT_{t-1}	-1.999*	
F-statistic	8.725*	
Pesaran et al. (2001) critical values		
Significance level	Lower bounds-I(0)	Upper bounds-I(1)
1%	3.65	4.66
5%	2.79	3.67
10%	2.37	3.20

Note: The optimal lag length is determined by the AIC criterion.
* indicates 1% significance level.

After the cointegration analysis was carried out, the long-run coefficients of the variables were determined. The long-run coefficients estimated in the context of the ARDL (3, 4, 4, 4) model are given in Table 6. When diagnostic tests are evaluated primarily, it is seen that there are no autocoresion and varying variance problems in the model and the series exhibit a normal distribution. Therefore, the ARDL long-run estimation indicates a suitable model.

According to these results; The effect of GDP on FD is positive and statistically meaningful at 1% significance level. A 1% increase in GDP leads to a 0.854% increase in FD. Another result from the analysis is that GFC positively affects FD at the 1% significance level. The 1% increase in the GFC increases FD by 1.221%. The FG variable positively affects FD at the 1% significance level and has the most impact on FD. In fact, the 1% increase in FG leads to a 3.032% increase in FD.

Table 6. ARDL Long-Run Estimation Results

Variables	Coefficient
C	-35.590*
	(0.000)
lnGDP	0.854*
	(0.000)
lnGFC	1.221*
	(0.000)
lnFG	3.032*
	(0.000)
Diagnostic Tests	
R^2	0.953
Adj. R^2	0.888
Breusch-Godfrey LM test[a]	0.371
	(0.951)
ARCH LM test[b]	0.001
	(0.973)
J-B normality test[c]	1.778
	(0.410)

Note: [a] Autocregation, [b] varying variance and [c] normality show test results and
* 1% significance level.

To test the consistency of the ARDL model estimation, FMOLS, DOLS, and CCR estimators were consulted in addition to this model. Table 7 provides FMOLS, DOLS and CCR model results.

Table 7. FMOLS, DOLS ve CCR Estimation Results

	FMOLS	DOLS	CCR
Variables	Coefficient	Coefficient	Coefficient
lnGDP	0.825*	0.799*	0.816*
	(0.000)	(0.000)	(0.000)
lnGFC	1.518*	1.236*	1.503*
	(0.000)	(0.002)	(0.001)
lnFG	1.797*	2.780*	1.823*
	(0.000)	(0.000)	(0.000)
C	-30.900*	-33.304	-30.702*
	(0.000)	(0.000)	(0.000)
R^2	0.921	0.983	0.920

Note: * indicates 1% significance level.

As shown in Table 7, in all estimation results, the effect of independent variables on the dependent variable is similar to that of the ARDL model. The coefficients of all independent variables are statistically meaningful at the 1% significance level, and all variables have a positive effect on FD. According to FMOLS, DOLS and CCR model results, the 1% increase in GDP leads to an increase of 0.825%, 0.799% and 0.816% on FD, respectively. Another conclusion from the study relates to the effect of GFC on FD. In model order, it was found that the 1% increase in GFC caused an increase of 1.518%, 1.236% and 1.503% on FD. The study also shows that the FG variable has a positive effect on the FD variable. The 1% increase in FG leads to an increase of 1.797%, 2.780% and 1,823% in model order on FD. It is the volatile financial globalization that has the greatest impact on financial development. Therefore, it can be said that financial globalization plays an important role in increasing financial development.

After estimating long-run coefficients, causality analysis of variables was performed with the Toda-Yamamoto causality approach. The results of the analysis are given in Table 8. As a result of the Wald test applied to models analyzed by SUR (Seemingly Unrelated Regression) methods developed by Zelner (1962), the bidirectional causality relationship between GDP and FD was determined. It has been found that there is a causality relationship of at 10% significance level from GDP to FD and 1% significance level from FD to GDP. Table 9 shows that there is a bidirectional causality relationship between GFC and FD. Another finding is the existence of a 10% significance level a unidirectional causality relationship from FG to FD. From FD to FG, the causality relationship has not been detected.

Table 8. Toda-Yamamoto Causality Results

Aspect of Causality	Chi-square	Prob	Decision
GDP→FD	7.076***	0.069	There's causality.
FD→GDP	17.213*	0.000	There's causality.
GFC→FD	6.908***	0.074	There's causality.
FD→GFC	22.205*	0.000	There's causality.
FG→FD	7.534	0.056***	There's causality.
FD→FG	1.963	0.579	There's no causality.

Note: *, *** indicate 1% and 10% significance level, respectively.

5. CONCLUSION AND DISCUSSION

In this study, the impact of economic growth, capital and financial globalization on financial development in the Turkish economy for the period 1990-2018 was determined. For this purpose, ADF, PP and Vogelsang-Perron unit root tests were applied to test the stationarity properties of the variables. The cointegration relationship between variables has been examined with the ARDL Bounds Test Approach. Long-run elasticity coefficients are estimated with ARDL, FMOLS, DOLS and CCR models.

According to long-run estimated results; economic growth, capital and financial globalization have a positive and meaningful impact on financial development. Toda Yamamoto's causality analysis found a bidirectional causality between financial development and GDP and capital. It has been determined that there is a unidirectional causality relationship between financial globalization and financial development. The finding in the study, which occurred in the context of the causality relationship between economic growth and financial development, is consistent with the finding of the bidirectional causality relationship between these variables in the studies of Demetriades and Hussein (1996) and Turkoglu (2016). The finding of the study that economic growth promotes financial development coincides with the study of Shan and Morris (2002), Pata and Agca (2018). The finding that financial globalization and globalization in general promote financial development is consistent with the study of Rincon (2007), Helhel (2017), and Balcilar et al. (2019).

Obstfeld (2008) argues that in the long-run, an open financial system at the international level causes countries to be a competitive and efficient allocation of resources on a global scale due to free capital mobility. The finding that financial globalization, which is the focus of the study, encourages financial development, may contribute to the development of some recommendations for policymakers and practitioners for the Turkish economy. In addition to the increase in growth and capital accumulation for the Turkish economy, financial globalization can contribute significantly to the lending process, which is considered the most important function of financial markets, and to the development of lending institutions. Therefore, financial liberalization can provide more easy access to the financial resources needed by the private sector. Directing credit to the private sector due to financial globalization to production and productive areas will make important contributions to Turkey's economic growth and development process. The public's incentives and practices in this direction are also important in ensuring sustainable growth.

This study has some limitations that may lead to new studies. In this study, the example of Turkey is based on time series analysis since it is investigated. In future studies, panel data studies can be carried out according to income level or based on any economic integration example. Or the effect can be investigated in the case of a different country other than Turkey. In this study, limited variables such as economic growth, capital and financial globalization are analyzed. In future studies, other determinants of financial development can be analyzed by including them in the financial sector development model. In addition, other indicators other than credits to the private sector can be analyzed as an indicator of financial development used as a dependent variable in this study. Therefore, this study offers new ideas for future studies and provides important contributions to the literature.

AUTHORS' DECLARATION
This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support.

AUTHORS' CONTRIBUTIONS

Conceptualization, writing-original draft – SSS; methodology, data collection, formal analysis, editing – BAT; Final Approval and Accountability – BAT

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