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Araştırma Makalesi

Empirical Reflections of the Nexus between Banking System Credits and Industry Production in Turkey: Co-integration and Causality Analysis

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Abstract

The existence of a developed financial system is essential for directing savings to the economy. The effects of the financial system and banks on the economy have been frequently investigated in the literature. This study aims to evaluate the efficiency of banking sector financing to produce output in Turkey. Today, as in many countries, the banking sector has been operating out of a dual banking system, including Islamic and conventional banks in Turkey. In this study, the co-integration and causality relationships between the financing provided by Islamic banks and conventional banks to the real sector and industrial production variables were investigated. According to the Johansen co-integration test results, the financing series provided by industrial production and conventional and Islamic banks to the real sector move together in the long run. According to the VECM causality analysis, a long-term causality relationship between the series from bank loans to industrial production can be mentioned.

Keywords: Islamic Banks, Conventional Banks, Industry Production, Cointegration, Causality
JEL Classification Codes: D24, G1, G21, O11

Türkiye'de Bankacılık Sistemi Kredileri ile Sanayi Üretimi Arasındaki Bağın Ampirik Yansımaları: Eşbütünleşme ve Nedensellik Analizleri

Öz

Bir ekonomideki tasarrufların ekonomiye etkili bir şekilde yönlendirilmesi o ülkede gelişmiş bir finansal sistemin varlığına bağlıdır. Finansal sistemlerin ve bankacılık sektörünün ülke ekonomisi üzerindeki etkileri konusu literatürde oldukça geniş bir yere sahiptir. Bu çalışmada, Türkiye'de bankacılık sektörü finansmanının sanayi üretimi üzerindeki etkinliğinin değerlendirilmesi amaçlanmıştır. Bugün, birçok ülkede olduğu gibi Türkiye'de de bankacılık sektörü konvansiyonel ve İslami bankalar olmak üzere ikili bankacılık sistemi üzerinden faaliyet göstermektedir. Bu çalışmada, İslami bankalar ve konvansiyonel bankaların reel sektöre sağladığı finansman ile endüstriyel üretim değişkenleri arasındaki eşbütünleşme ve nedensellik ilişkileri araştırılmıştır. Johansen eşbütünleşme testi sonuçlarına göre sanayi üretimi ile konvansiyonel ve İslami bankaların reel sektöre sağladığı finansman değişkenleri arasında uzun vadede birlikte hareket söz konusudur. VECM hata düzeltme modeline dayalı olarak gerçekleştirilen nedensellik analizine göre ise banka kredilerinden sanayi üretimine doğru uzun vadeli bir nedensellik ilişkisinden bahsedilebilmektedir.

Anahtar Kelimeler: İslami Bankalar, Konvansiyonel Bankalar, Sanayi Üretimi, Eşbütünleşme, Nedensellik
JEL Sınıflandırma Kodları: D24, G1, G21, O11

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1.Introduction

The concept of the financial system refers to the broad definition of finance. Financial systems reduce information and transaction costs. It also covers how financial decisions are made and financial relationships are designed and implemented. Levine (1997) describes financial markets and institutions' essential functions as mobilizing savings, reducing the costs of acquiring and processing information, facilitating allocating funds to efficient and productive areas, and promoting effective corporate governance. How advanced the financial system in a particular country or region depends on the answers to questions such as what financial alternatives the economic actors in that country or region have, to what extent they can use these opportunities to make wealth, to transfer their income to the future, to finance their investments and to manage risk (Schmidt & Hryckiewicz, 2006).

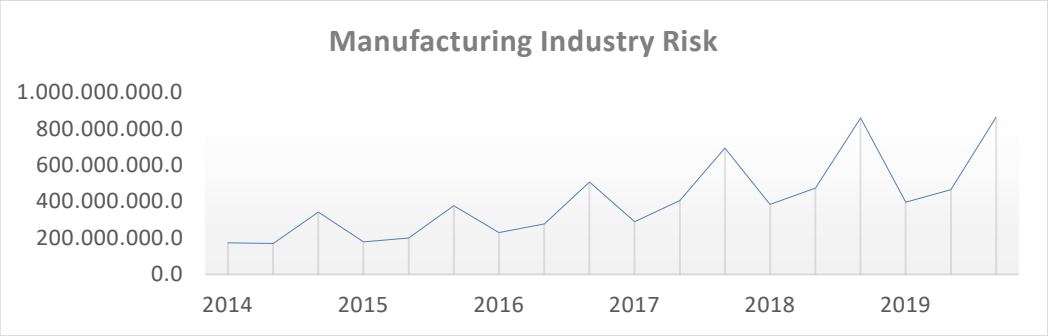
The economic system consists of two necessary parts: the real and financial sector. Investment and production activities are carried out in the real sector. On the other hand, the financial sector fulfills funding the real sector's activities (Karahan, Yilgör & Özekin, 2018). The financial system fulfills the function of funding the real sector through capital and money markets. While there is direct financing through debt (bonds and bills) and stocks in the capital market, in the money market, the real sector is funded indirectly by banks through funds collected from savers.

The production sector, which is an essential representative of the real sector, contributes significantly to the total welfare by contributing to the increase of total production in a country and the added value to its economy. The manufacturing industry plays a critical role in economic growth, especially in developing countries. The increase in total production is attributed to the increase in the number of companies operating in the manufacturing industry or the market shares and capacities of existing companies. It is possible by having access to the amount of financing to increase production when they need it. The most important of these financial resources are banks with external financing resources. The access of companies operating in the sector to external financing resources is critical in increasing their profitability and realizing their growth strategies. Foreign financing resources are highly preferred, especially in developing countries where the development of financial markets is insufficient. At this point, bank loans obtained from money markets stand out. Bank loans are frequently preferred by companies operating in the production sector for financing short and long-term investments (Demirci, 2017). Commercial banks, participation banks, and non-bank financial institutions provide resources to companies in Turkey.

The financial statements of publicly traded companies operating in Turkey show a significant share of debt in the capital structure. It is noteworthy that most of these

companies are leaders in their sector. The study of the "Sectoral Balance Sheets 2019 Report" was done by the Central Bank of the Republic of Turkey (CBRT) and the Turkish Statistical Institute (TURKSTAT). According to the report, financial statements of companies operating in 17 main sectors, including manufacturing and non-manufacturing, are included. The financial statements cover 11 years between 2009-2019 and over 1 million companies. According to the said report, the sector that benefited the most from bank financing in the last eleven years was the manufacturing sector with 2.9 trillion TRY. When the loans provided to the real sector are analyzed, it is seen that long-term loans reach 1.9 times that of short-term loans. While long-term bank loans used in the said period were TRY 6.7 trillion, short-term loans were TRY 3.6 trillion (CBRT, 2020).

Graph 1 contains the entire manufacturing sector risk, which was created using the CBRT-TURKSTAT Sector Balance Sheets 2019 study data. The graph includes total Cash Loans, Non-Cash Loans, Loans to be Liquidated, Bonds, Financing Bills, and Funds for Leasing Purposes in Turkish Lira and foreign currency. Vertical lines across years show short-term, long-term, and total debt levels, respectively. The peaks between two years represent the total risk. Accordingly, risk levels are in a steady increase, depending on the loan transactions of manufacturing companies.

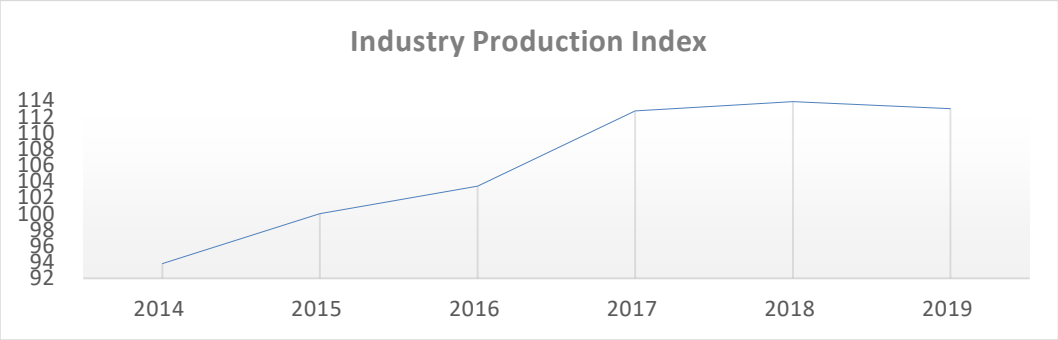


Source: Created by the author.

Graph 1: Manufacturing Industry Risk

Graphic 2 shows the annual average industrial production index data for the same period. Industrial Production Index; It covers Mining and Quarrying, Manufacturing and Electricity, Gas, Steam and Air Conditioning Production and Distribution sectors. The data used in the Industrial Production Index calculation consists of the data obtained from the Monthly Industrial Production Questionnaire and the turnover information calculated from the Revenue Administration data. The published data are temporary, and the last two months' data are revised every month (TURKSTAT, 2020). In this context, industrial production index data were obtained from TURKSTAT. Accordingly, industrial

production, which increased steadily between 2014 and 2017, entered a recession period since 2017.



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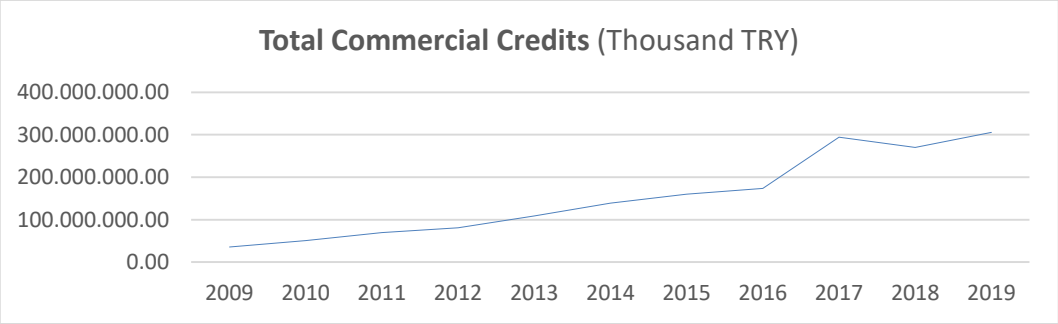
Graph 2: Manufacturing Industry Risk

Banks undertake an important supplier function in terms of economic development and employment by supporting the real sector with the loans they provide, investment, production and especially during crisis periods (Çamoğlu & Akıncı, 2012:194). Graph 3 shows the amount of commercial loans provided to the real sector by public, private, and foreign banks between 2009-2019, in line with the CBRT EDDS data. Accordingly, it is noteworthy that although commercial loans increased in the said period, the acceleration of the increase slowed down since 2017 in parallel with the stagnation in the industrial production index.



Source: Created by the author.

Graph 3: Total Commercial Credits

This situation brings to mind the loan financing-production output relationship. In this context, it is expected that there will be an interdependent relationship between the real sector and the financial sector. Telatar (2002) states that in the credit approach, which is one of the monetary transmission mechanisms,

emphasizing banks' money and credit creation functions, monetary policies will work by affecting banks' assets and liabilities.

Based on the above facts, this study investigates the relationship between industrial production and loans transferred from the banking sector to the real sector. Here, industrial production, which is taken as the industrial production index, is also evaluated as an indicator of economic growth. The fact that the frequency of industrial production index data is higher than GDP required the use of the industrial production index in the analysis section of the study. In the study, the relations between the funds provided by the conventional and Islamic banks to the real sector and industrial production were analyzed for the period of 2008: M6-2020M9 by Johansen cointegration analysis, VECM procedure and variance decomposition analysis.

In the next part of the study, first, the theoretical framework and a summary of the literature will be given, and then the analysis part will be started.

2.Theoretical and Empirical Literature

The relationship between financial markets and economic growth has been studied with academic and policy makers' curiosity for many years. Financial markets, which are an essential element of financial systems, are expected to be well-organized, with confidence and depth to the fore.

The well-functioning banking system, an essential sub-component of financial systems, will contribute to economic growth by providing financing and allocating capital to high-return investments. Thus, it allows higher aggregate output and consumption levels, greater availability of capital, higher total factor productivity, and the intertemporal smoothing of consumption patterns (Turner, 2010). In this context, banks and the banking sector's structural differences, which are among the most important actors of the country's financial systems and markets, can be a significant economic development factor.

Leading researchers of the growth literature such as Gurley & Shaw (1955) and Goldsmith (1969) have identified strong relationships between the economic growth levels of countries and the development level of their financial systems. Robinson (1952) emphasized that with the increasing demand for financial services, growth in the real economy was achieved and this situation brought financial development together.

Bencivenga & Smith (1991) stated that increasing the financial sector's efficiency will realize risk sharing, which will support economic growth. Odedokun (1996) found that financial development plays a leading role in economic growth. Aghion, Howitt, and Mayer-Foulkes (2005) stated that financial development would contribute to economic growth by reducing intermediary and transaction

costs. Greenwood, Sanchez, and Wang (2010) emphasized that financial development will benefit the real economy by increasing savings mobility. Botev, Égert & Jawadi (2019) stated that they demonstrate a positive relationship between financial development and economic growth, based on the fact that increasing the level and level of financing alternatives can help improve capital allocation, reduce adjustment costs, increase lending to households, and firms, and encourage high-return investment.

Although attention has been drawn to the positive relations between financial development and economic growth in general, there are also recent studies that argue that negative relations may be in question (Rousseau & Wachtel, 2011; Pakravan, 2011; Gennaioli, Shleifer, & Vishny, 2012; Huang, Fang & Miller, 2014; Aizenman, JinJarak & Park, 2015). Rousseau & Wachtel (2011) emphasized that in new studies investigating the positive relationship between finance and economic growth, it is seen that the combination of the pre and post-global crisis periods is no longer valid. Botev, Égert & Jawadi (2019) emphasize that when capital in a country is used to finance real estate investments (through mortgages) rather than financing more efficient investment areas, competitiveness and growth can be damaged.

The relationship between the banking sector and economic growth is the most crucial element of the financial system, especially in developing economies. This is also a significant risk factor for financial stability. In the absence of a developed financial market, financing from the banking sector is preferred instead of equity financing. This situation causes banks to face relatively higher credit risks. As observed in the high level of short-term borrowing in the countries' financial structures, weak points are the critical sources of fragility that are likely to cause financial instability and financial crises. A decrease in demand for financial assets in one or more of the sectors operating in a country's economy brings with it a financial crisis. In such a conjuncture, banks are faced with problems such as not being able to meet their deposit outflows, withdraw new deposits, or not paying existing short-term debts. Therefore, countries must have a financially secure position. Thus, it can be predicted to what extent financial problems will reflect the real sector during the financial crisis (Swamy, 2014).

Relationships between the banking sector, which is an essential element of the financial system, and production and economic growth have been a research topic that has been up-to-date from past to present. Gurley & Shaw (1955) were among the first to examine the relationship between credit supply and output growth in developed countries. Cottarelli, Dell'Ariccia & Vladkova-Hollar (2003) investigated the long-term relationships between loans to the private sector and GDP in developing and industrialized countries. They found a positive and significant relationship between GDP per capita and lending. However, inflation above a certain threshold affects this relationship negatively. Simultaneously,

greater financial liberalization and transparency in accounting standards enable a higher bank loan / GDP ratio. They also found a long-term relationship between loans provided to the private sector and manufacturing sector production. Alfaro, Chanda, Kalemli-Ozcan & Sayek (2004) determined that the bank credit channel is the primary source of macroeconomic activity in Chile. Bank loans also stimulate the manufacturing sector, which is an essential component of economic growth. Rondorf (2012) investigated whether changes in the volume of bank loans significantly affect production in the euro area. They found that fluctuations in credit were a cause in production output in the euro area. The results obtained show that bank loans are an essential determinant of the increase in production in the Eurozone. Rahimzadeh (2012) examined the effects of stock markets and banks in the Middle East and North Africa on the industrial production of countries. According to their findings, the banking sector has a positive and significant effect on the production levels of countries. Muchingami, Monametsi & Paradza (2017) found a positive relationship between commercial bank loans and production volume index as a result of their study examining the effect of bank loans on manufacturing sector performance in Zimbabwe. Ogunmuyiwa, Okuneye & Amaefule (2017) examined the impact of bank loans on manufacturing sector growth in Nigeria. According to the results of their studies, bank loans given to the private sector positively affect the manufacturing sector. Vestman & Viebroc (2018) analyzed whether the changes in credit growth in Iceland significantly affected production output and determined that credit and exports' changes had the most significant impact on Icelandic production. They concluded that changes in credit activity affect macroeconomic variables in Iceland.

Tongurai & Vithessonthi (2018) emphasized that the effects of banking sector development on industrial and agricultural sectors' development will be positive, as countries focus on industrialization in the early stages of economic growth. The authors also stressed that while the impact on industrial sector development in the later stages of growth is still expected to have a positive effect, its effects on the development of the agricultural sector are expected to be negative or not at all. Botev, Égert & Jawadi (2019) found that banking and market finance reinforce each other's positive impact on economic performance. In particular, the positive effect of banking finance becomes more critical in the presence of deepening capital markets. Andabai & Eze (2018) investigated the causality between bank loans and manufacturing sector growth in their study in Nigeria and concluded that there is no causal relationship between the variables.

Elijah (2019) studied the impact of bank loans on manufacturing output in the deregulated Nigerian economy for 1986-2016. It has been determined that bank loans contribute positively to manufacturing sector production in both short and long terms. Furthermore, it has been observed that the exchange rate, savings, and interest rate are the causes of the production sector output.

Masuduzzaman, Parveen, Islam & Dipty (2020) found that financing positively contributed to SMEs' production and sales levels in Bangladesh. The results showed that SMEs' production level operating in the industrial sector is more sensitive to bank financing.

In addition to conventional banks, we have come across studies focusing on the effects of the resources transferred to the private sector by Islamic banks on economic growth and industrial production more frequently. Boukhatem & Moussa's (2018) study on the countries of the MENA region and they found that financial development supports economic growth. Bougatef, Nakhli & Mnari (2020) examined the relationship between Islamic finance and industrial production in Malaysia and found that Islamic finance plays a vital role in increasing industrial production in the short and long term. Ergec & Selcik (2020), the interaction between the real economy and Islamic banking in Turkey, has been analyzed compared to traditional banking. As a result of the study, it was seen that the number of causal relationships between industrial production and Islamic banking is less than traditional banking and the direction of these relations is mainly from the production to banking.

Furqani & Mulyany (2009), Majid & Kassim (2010), Abduh & Chowdhury (2012), Benes & Kulhof (2012), Abduh & Omar (2012), Abduh, Brahim & Omar (2012), Barajas, Chami & Yousefi (2013), Tabash & Dhankar (2014), Imam & Kpodar (2016), Tunay (2016) and Jawad & Christian (2019), Setiawan (2020), Mensi, Hammoudeh, Tiwari & Al-Yahyaee (2020) are among other studies in the literature on the relationship between Islamic finance and the real sector and economic growth. The common conclusion of these papers is that the Islamic banking sector positively contributes to economic growth.

The relationship between banking credits and industrial production, which has become even more critical with the globalizing world and developments in financial liberalization and integration, may continue to examine from different angles and in-depth.

3. Data & Methodology

In this study, to increase the frequency of data and obtain healthier results, the industrial production index (INDUSTRY) was taken as an indicator of economic growth and representing the real sector output. Critical variables included in the analysis are Islamic banks' credit to the real sector (ISLAMIC) and conventional banks' credit to the real sector (CONVEN). In order to reveal the relationships between variables, Johansen cointegration analysis, VECM procedure and variance decomposition analysis were used as the analysis method. The study covers monthly data between 2008:6M-2020:9M. Islamic banking data could be reached until the 6th month of 2008 at the most. Conventional banking sector data

are also determined to cover the same periods in order to make a consistent comparison with the relationship between Islamic banking loans and industry.

Credit amounts used in the study are those given only to the private sector, excluding the public sector. The reason is that the credits are given to the public sector move in the opposite direction to the private sector's credits. Thus, especially in the economic recession, while the credits extended to the real sector decrease, the public's credits are increasing (Caporale & Helmi, 2016).

Our main aim is to investigate the success of Islamic and conventional banks in financing real economic activities. The selection of the variables is also appropriate with the given literature trying to establish the theoretical link between Islamic and conventional finance and real economic activities. Banking credit data are retrieved from the Banking Regulation and Supervision Board of Turkey and the Industrial production data are collected from the CBRT Electronic Data Delivery System (EVDS). Eviews 10 and Stata 15 econometric analysis programs were used in the analyzes.

All the variables (later used in the model) seasonally adjusted and expressed logarithmic f**o**rm. The general representation of the models to be analyzed are as follows:

$$lnIndustry_t = \beta_0 + \beta_1\, lnConven_t + \varepsilon_t \quad (1)$$

$$lnIndustry_t = \beta_0 + \beta_1\, lnIslamic_t + \varepsilon_t \quad (2)$$

Where β_1, *is* the coefficient to be estimated and ε_t is the error term. The error term represents the influence of the omitted variables in the construction of the data.

3.1 KPSS Unit Root Test

In the second stage of the study, unit root tests were used. Before proceeding to the Johansen Cointegration test, the forward series's stationarity should be examined with unit root tests. In the study, the test suggested by Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) (1992) was used. This test is based on the nonparametric estimator of the long-term variance of residuals. In the test of KPSS, the aim is to become stationary the series by purifying the deterministic trend in the observed series.

The following regression model is used in the KPSS unit root test (Kwiatkowski et al., 1992: 161):

$$y_t = \alpha + \delta t + \rho y_{t-1} + \varepsilon_{3t} \quad (3)$$

Where α is constant; t is linear time trend; p is the number of lags, and ε is the error term.

Unlike other unit root tests in the KPSS test, the primary hypothesis argues that the series is stationary. Hypotheses determined as $H_0 : \rho < 1$ *(The variable has no unit root (Series is stationary))* and $H_1 : \rho = 1$ *(The variable has a unit root (Series is not stationary))*. The LM test statistic is compared with the critical values of KPSS (1992).

The LM test statistics for testing hypotheses are as follows:

$$LM = \sum_{t=1}^{T} S_t^2 / \hat{\sigma}_\varepsilon^2 \qquad t = 1, 2, 3, ..., T \tag{4}$$

Where $S_t = \sum_{i=1}^{T} \varepsilon_t$ is the partial sum of the residues. ε_t's for the fixed and trended model, the residuals of y_t obtained from the fixed and trended regression model; they are the residuals obtained from the regression of y_t on the constant for the fixed term model only. $\hat{\sigma}_\varepsilon^2$ is the variance ($\sum_{t=1}^{T} e_t^2 / T$) of the estimate obtained from these regressions (Sevüktekin & Nargeleçekenler, 2014).

The following models (constant and trend; constant and no trend) are examined for unit roots using the KPSS test:

$$\Delta X_t = \alpha_0 + \alpha_1 X_{t-1} + \sum_{t=1}^{k} \lambda_t \Delta X_{t-1} + \varepsilon_t \tag{5}$$

$$\Delta X_t = \alpha_0 + \alpha_1 X_{t-1} + \sum_{t=1}^{k} \lambda_t \Delta X_{t-1} + \beta t + \varepsilon_t \tag{6}$$

where X_t is the respective time series; α_0 is the intercept; t is the linear time trend; Δ is the first difference operator; and ε_t denotes the error process with zero mean and constant variance

3.2 Johansen Co-Integration Analysis

In the rest of the study, co-integration, vector error correction, long and short-term causality, and variance decomposition analyses have been carried out. In this context, Johansen co-integration analysis was performed first, and then VECM and variance decomposition analyzes were carried out. The analysis aimed primarily at determining the relationship between conventional bank loans and industrial production.

Johansen's maximum likelihood test is a test used in cases where there is a possibility of more than one co-integration vector. For example, the Johansen test can be used when the first differences of all series are stationary. This test tries to determine whether there is a stable long-term relationship between the series. The Johansen ML procedure produces a set of results used to determine the number of cointegrating vectors available. Consequently, the number of variables included in the *g* model will be the vector *g-1*. Based on this result, long-term coefficients can be determined, and the resulting error correction model can be generated.

The long-term equilibrium relationship between dependent and independent variables is called co-integration. Engle & Granger's (1987) procedure and Johansen & Juselius's (Johansen & Juselius, 1990, Johansen, 1992) are the most common tests in investigating the co-integration relationship.

The Johansen method is a generalized representation of the Dickey-Fuller method.

$$X_t = \Pi_1 X_{t-1} + ... + \Pi_k X_{t-k} + e_t \quad (7)$$

Here *X* represents the vector of variables expressed with their past values. The system of equations for which the degrees of stationarity are decided is expressed as the VAR model in which the lagged values of the variables take place. When we express the model with moving average representation, the following equation is reached.

$$A(e) = I - \Pi_1 e - ... - \Pi_k e_k \quad (8)$$

The rank r of the matrix A gives the number of cointegrating vectors. It can be only one minus $r < p$ of p dimensional variable vector in the equations. The error term e has the white noise process.

$$A(e)|_{e=1} = \Pi = I - \Pi_1 - ... - \Pi_k, \qquad \Pi = \alpha\beta' \quad (9)$$

The coefficient matrix Π is the product of the $(p \times r)$ dimensional α and β' matrices. α is the rate of adjustment and β' is the matrix obtained by the maximum likelihood estimation where the number of rows it has is equal to the number of cointegrated vectors. It is aimed at evaluating the hypothesis that suggests that there are the most *r* cointegrating vectors, with the probability estimation at most (Bozkurt, 2013, pp. 116-117).

3.3. Vector Error Correction Model

Granger (1988) expresses that there should be at least one directional causality if there is a co-integration relationship between variables. However, the co-

integration analysis does not provide information about the direction of causality between variables. Granger (1988) states that if there is a co-integration relationship, the causality relationship between the variables in question can be examined by applying it to VECM. It is essential to distinguish between short and long-term causality relationships in VECM. While lag values in independent variables represent short-term causality effects, the error correction term represents long-term causality (Love & Chandra, 2005:136). After proving the existence of a long-term relationship between series, it is necessary to show the short-run movements of the related variables in the long run. The vector error correction mechanism makes the short-term analysis of the VAR model. After determining the co-integration relationship between variables, it was estimated VECM to analyze the short-term effects of these variables. Error correction variable is expected to be between 0 and -1 and be statistically significant. If this is the case, it is expected that the variables may come to a long equilibrium. Deviations from the equilibrium state can be corrected depending on the long-run correction variable's coefficient (Sinan, 2020).

Once the co-integration relationship is determined based on the Johansen test, Granger causality tests should be performed under the vector error correction model (VECM). By doing this, short-term deviations from the long-term equilibrium of the series can also be captured by including an error correction term (Katırcıoğlu, 2009:5). Under the assumption that X and Y series are cointegrated, we can show the error correction model (ECM) as:

$$\Delta y_t = \alpha_0 + \alpha_1 x_t + \alpha_2 u_{t-1} + v_t$$

Here, Δy_t refers to short-term fluctuations in x_t variable and u_{t-1} refers to adjustments towards long-term equilibrium. The α_2 coefficient indicates deviations and is also called the adjustment or adaptation rate. If α_2 is statistically significant, it reveals to what extent the short-term imbalance in x_t will be corrected after a period of time. If it is positive, it is moving away from long-term equilibrium, if it is negative, the deviation approaches the long-term value. Therefore, when it is negative, it can be said that the error correction mechanism works and the deviation decreases (Dikmen, 2012, p. 332).

The causality test between the variables with cointegration is performed through VECM (Vector Error Correction Model). The VECM model is also shown as follows:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta X_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta Y_{t-1} + \varphi ECT_{t-1} + \mu_t$$

Here, the *ECT* error correction coefficient, *p* is the optimum lag length. The fact that the ECT coefficient is negative and statistically significant indicates that the short-term deviations between the co-integrated series disappear in the long term and the series come to balance together in the long term (Akpolat and Altıntaş, 2013, p. 121).

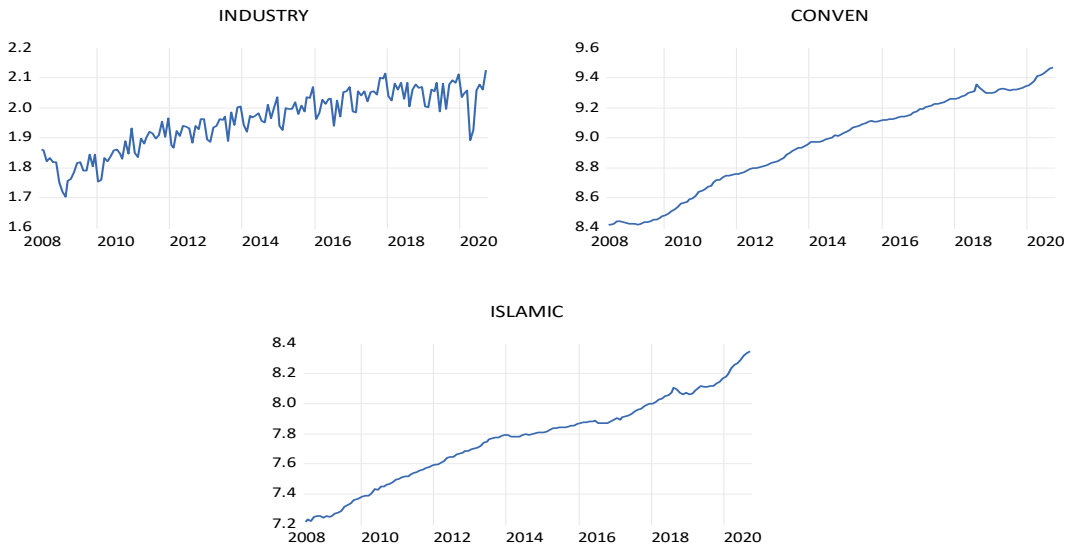
4. Empirical Results

Table 1 shows the descriptive statistics of the series. In this context, the mean of the series, median values, skewness and kurtosis values, Jarque-Bera statistic, standard deviations, maximum and minimum values, and total observation values are included.

Table 1: Descriptive Statistics

	Industry	Conven	Islamic
Mean	1.956038	8.955067	7.760499
Median	1.966778	8.996504	7.793528
Maximum	2.124320	9.467583	8.346931
Minimum	1.702895	8.418661	7.214645
Std. Dev.	0.096826	0.315540	0.286371
Skewness	-0.459751	-0.294720	-0.169143
Kurtosis	2.395810	1.837076	2.244736
Jarque-Bera	7.464935	10.48230	4.223309
Observations	**148**	**148**	**148**

Graph 4 shows the graphs of all series in the data set. Accordingly, all index series have an increasing trend. On the other hand, industrial production showed a sharp decline in 2019 with the effect of the pandemic process; this decline continued for a certain period in 2020 and then entered an increasing trend.



Graph 4: Trends of the Series over Time

4.1 Unit Root Test Results

Table 2 shows the results of the KPSS unit root test in constant *(u)* and constant *(u)* - trend *(t)* models. According to these results, while all series contain unit root in their level values, their first differences become stationary. Therefore, the analysis will continue with the first differences of the series.

Table 2: KPSS Unit Root Test Results

			LM-Stat.			
	Industry		***Conven***		***Islamic***	
	u	***u & t***	***u***	***u & t***	***u***	***u & t***
St	1.3247*	0.2840*	1.4302*	0.2925*	1.4195*	0.2115**
	0.7390	0.2160	0.7390	0.2160	0.7390	0.2160
Lv	0.463	0.1460	0.4630	0.1460	0.4630	0.1460
	0.3470	0.1190	0.3470	0.1190	0.3470	0.1190
St	0.2031	0.1513**	0.1106	0.0843	0.1969	0.1982**
	0.7390	0.2160	0.7390	0.2160	0.7390	0.2160
Fd	0.4630	0.1460	0.4630	0.1460	0.4630	0.1460
	0.3470	0.1190	0.3470	0.1190	0.3470	0.1190

**1% ; **5% ; ***10% expresses the critical values in significance levels; St: KPSS t statistics; Lv: Critical Values at level; Fd: Critical Values at first diff.; Critical Values: Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)*

According to the KPSS test results, the null hypothesis stating that the series is stationary is rejected for both of the series. So the series is not stationary at the level. In order to determine whether the series are stationary in their first differences, the same unit root tests were performed again by taking their first differences. As a result of the unit root tests, it was determined that all series are stationary in their first differences, *I(1)*, at *%1*, *%5*, and *%10* significance levels (H_0 (series are stationary) hypothesis is accepted). Since all the variables we use in the analysis are stationary in their first differences, we decided to apply the Johansen Co-integration test.

4.2. Johansen Co-Integration Analysis: Industry-Conven

After determining the stationarity levels of the series, the next step is to apply the co-integration analysis. Essentially, the Johansen procedure is based on the VAR model. In VAR models, determining the number of lags is a critical step. Also, deterministic terms, if any, should be included in the VAR model. The deterministic terms in question can be an intercept, a trend, or both. In this study, trend and constant are included in the forecasts.

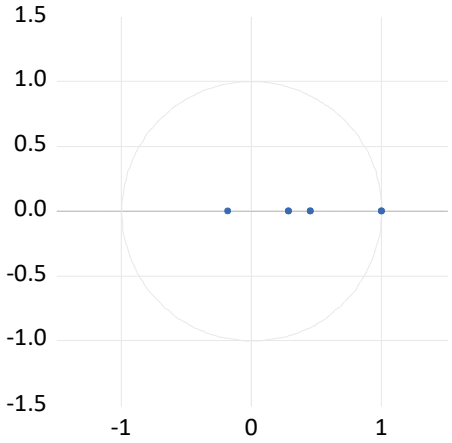
Three basic models, namely Akaike Information Criterion (AIC), Schwarz (SC) criterion, and Hannan-Quinn (HQ), are preferred to determine the lag length in general. Table 3 shows the results. Due to the low number of observations, the lag length was determined over a maximum of eight lags and five of them were reported.

Table 3: Lag Lengths

Lag	LogL	LR	FPE	AIC	SC	HQ
0	224.9166	NA	0.000142	-3.184523	-3.142500	-3.167446
1	742.7025	1013.381	9.21e-08	-10.52432	-10.39825*	-10.47309
2	749.1376	12.41055	**8.90e-08***	**-10.55911***	-10.34899	**-10.47372***
3	749.6655	1.002941	9.35e-08	-10.50951	-10.21534	-10.38997
4	754.5154	9.076159	9.24e-08	-10.52165	-10.14344	-10.36795
5	760.0603	10.21845*	9.04e-08	-10.54372	-10.08146	-10.35587

As a result, the FPE, AIC, and HQ criteria indicate two lag lenghts in the model. SC criterion indicates that there should be a lag in the model. Since the recommended lag length differs between the criteria, in the later stages of the co-integration analysis, two lags (*the number of lags indicated by the majority*) were considered.

The VAR model must be constructed correctly (*fulfill the stationary condition*) to perform the Johansen test. Whether the VAR model meets the stability condition can be determined by looking at the inverse roots graph and the AR characteristic polynomials' table. Graph 5 shows that the points are in the unit circle, and in Table 4, all of the Modulus values are less than 1. According to these results, the VAR model was constructed correctly, and the stability condition was provided.



Source: Analysis Output

Graph 5: Inverse Roots of AR Characteristic Polynomial

Table 4: VAR Stability

Root	Modulus
0.998171	0.998171
0.451619	0.451619
0.285151	0.285151
-0.179120	0.179120
No root lies outside the unit circle. Therefore, VAR satisfies the stability condition.	

The VAR model's lag number was determined and the stability condition were met. In the next stage of the study the Johansen co-integration test was conducted to determine the long-term relationship between the series. The trace and maximum eigenvalue statistics in Table 5 shows that the H_0 hypothesis, which states that there is no co-integration matrix between the series ($r=0$), is rejected with *5%* significance. *Trac*e and *Max-Eigen* statistics and probability values examined from the Johansen co-integration test results in Table 5 indicated that there is at most one co-integration vector between the series.

Table 5: Unrestricted Cointegration Rank Test (Trace&Max-Eigen)

Hypothesized No. of CE(s)	***Eigenvalue***	***Trace Statistic***	***0.05 Critical Value***	***Prob.*****
H_0: r=0*	0.258379	45.89618	25.87211	0.0000
H_0: r≤1	0.017454	2.553249	12.51798	0.9248

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values

Hypothesized No. of CE(s)	***Eigenvalue***	***Max-Eigen Statistic***	***0.05 Critical Value***	***Prob.*****
H_0: r=0*	0.258379	43.34293	19.38704	0.0000
H_0: r≤1	0.017454	2.553249	12.51798	0.9248

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level;**MacKinnon-Haug-Michelis (1999) p-values

After proving the co-integration relationship between the series, the long *(β)* and short *(α)* term coefficients were estimated in the next stage of the study.

4.2.1 Vector Error Correction Model (VECM)

Granger (1988) was indicated that if it is determined that there is a co-integration relationship between variables, at least one causality relationship is expected between the variables in question. In such a case, the Vector Error Correction Model (VECM) should be applied to detect causality. The differencing process applied to stabilize the variables can cause losses in the long-run information of the variables. VECM provides an advantage over other methods by preventing losses in this matter (Kolçak, Kalabak & Boran, 2017:479-480).

After determining the long-run co-integration relationship between industrial production and bank credits, the short-run co-integration, the long-run causality and the model's response against deviations from the long-run balance were tested by the error correction mechanism. Error correction coefficient (EC_t), *C(1)*, must be statistically significant and take a value between *0* and *-1*. This situation indicates that the *VECM* model works effectively and it is interpreted as the changes that may occur in the variables will return to equilibrium in the long run. The rate of correction to equilibrium is *C(1).* We see that *C(1)* is negative *(-0.838141*) and significant in Table 6, so there is a long-run positive causality relationship from conventional bank credits to industrial production. It can be said

that a one-unit increase in conventional bank loans increases industrial production by approximately *0.58* unit. In other words, there are long-run positive causality and short-run co-integration relationship between industrial production and conventional banks credits that provide to the private sector.

After determining the long-run causality relationship, the model's reaction against deviations from the long-run balance was tested with the error correction mechanism. Because the error correction model is statistically significant and EC_t is negative, a re-equilibrium will occur in the face of departures from long-term balance. Approximately *84%* of deviations are corrected when out of balance occurs.

Table 6: Normalized Equation and Error Correction Model

Industry(-1)	1.000000
Conven(-1)	-0.582058
	(0.08640)*
	[-6.73668]
@TREND(08M06)	0.002215
	(0.00064)
	[3.47508]
C	3.092269

Industry = -3.0923+0.58206 Conven +0.00222*@TREND(08M06)

Error Correction Model

D(Industry)=C(1)*(Industry(-1)-0.582057547237*Conven(-1)+
0.00221497909284*@Trend(08m06)+3.0922688283)+C(2)*D(Industry(-1))+
C(3)*D(Industry (-2)) + C(4)*D(Conven (-1)) + C(5)*D(Conven (-2)) + C(6)

EC_t=-0.838141*[-6.84363], * %10 significance

To determine short-term causality, using the error correction model's coefficients, equation *C(4)= C(5)=0* was tested with the Wald test. Table 7 shows that the H_0 hypothesis, which suggests that *C(4)=C(5)=0*, could not be rejected, and it was concluded that there was no short-term causal relationship between the series.

Table 7: Wald Test

Test Statistic	Value	df	Prob.
F-statistic	0.363322	(2, 139)	0.6960
Chi-square	0.726643	2	0.6954

4.2.2. Variance Decomposition

The variance decomposition results evaluated to determine the comparative significance of the random shock occurring on the variables should also be tested. Variance decomposition separates the change in one of the internal variables as

separate shocks affecting all internal variables, giving information about the system's dynamic structure.

In Table 8, the effect of a shock that may occur in the industrıal productıon variable on the current and future values of the funds provided by conventional banks to the real sector variable. With the variance decomposition method, the effect of the credit provided by traditional banks on industrial production was tested for ten periods. A change in industrial production originates only from itself (other factors that may affect industrial production, excluding traditional banks) in the 1st period. In this sense, it can be said that traditional banks did not affect industrial production in the first period. After the second period, the effect arising from traditional banks emerges and increases over the periods. Thus, the effect of the change in credits on industrial production increases over time.

Table 8: Variance Decomposition Analysis Results

Variance Decomposition of Industry:			
Period	**S.E.**	**Industry**	**Conven**
1	0.038933	100.0000	0.000000
2	0.040341	99.85456	0.145441
3	0.040900	99.67348	0.326521
4	0.040990	99.27926	0.720744
5	0.041094	98.78393	1.216069
6	0.041214	98.21266	1.787338
7	0.041339	97.61863	2.381373
8	0.041467	97.01714	2.982858
9	0.041596	96.41876	3.581237
10	0.041724	95.82592	4.174078

4.3. Johansen Co-Integration Analysis: Industry-Islamic

First of all, lag length analysis based on three criteria was carried out to determine the lag length in the model. As seen in Table 9, all criteria refer to 2 lag lengths.

Table 9: Lag Lengths

Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	225.3054	NA	0.000141	-3.190077	-3.148054	-3.173000
1	716.2373	960.8240	1.34e-07	-10.14625	-10.02018	-10.09502
2	736.5656	39.20446	**1.06e-07***	**-10.37951***	**-10.16939***	**-10.29412***
3	737.7381	2.227834	1.11e-07	-10.33912	-10.04495	-10.21958
4	739.8451	3.943115	1.14e-07	-10.31207	-9.933862	-10.15838
5	742.8628	5.561202	1.16e-07	-10.29804	-9.835782	-10.11019
6	751.1707	15.07287*	1.09e-07	-10.35958	-9.813277	-10.13758
7	751.8305	1.178144	1.14e-07	-10.31186	-9.681512	-10.05571
8	754.0719	3.938561	1.17e-07	-10.28674	-9.572343	-9.996432

Then, the analyzes were continued to determine whether the stability condition was fulfilled. According to Inverse Roots of AR Characteristic Polynomial and

VAR Stability Root and Modulus values it is seen that the stability condition is valid.

After determining that the VAR model's lag number and stability condition were met, the co-integration test proposed by Johansen (1988) was performed to determine the long-term relationship between variables. The results of the trace and maximum eigenvalue tests presented in Table 10 show that the null hypothesis that the co-integration matrix is zero (*r=0*) is rejected with *5%* significance. Therefore, there is at most one co-integration vector that establishes long-term equilibrium relations between variables.

In both tests, the null hypothesis (no co-integration vector) is rejected. The variables are cointegrated. It means that there is at most one long-run equilibrium relationship between them.

Table 10: Cointegration Model Outputs

Hypothesized No. of CE(s)	***Eigenvalue***	***Trace Statistic***	***0.05 Critical Value***	***Prob.*****
H_0: r=0*	0.184778	29.62433	15.49471	0.0002
H_0: r≤1	1.13E-05	0.001640	3.841466	0.9654

Trace test indicates one cointegrating eqn(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values

Hypothesized No. of CE(s)	***Eigenvalue***	***Max-Eigen Statistic***	***0.05 Critical Value***	***Prob.*****
H_0: r=0*	0.184778	29.62269	14.26460	0.0001
H_0: r≤1	1.13E-05	0.001640	3.841466	0.9654

Max-eigenvalue test indicates one cointegrating eqn(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level;**MacKinnon-Haug-Michelis (1999) p-values

4.3.1 Vector Error Correction Model (VECM)

After determining the long-run co-integration relationship between industrial production and bank credits, the short-run co-integration, the long-run causality and the model's response against deviations from the long-run balance were tested by the error correction mechanism. Table 11 shows the normalized coefficients and error correction model. According to Table 11, *C(1)* is negative (*-0.531383*) and significant, so there is a long-run positive causality relationship from Islamic bank credits to industrial production. It can be said that a one-unit increase in Islamic bank loans increases industrial production by approximately *0.31* unit. In other words, there are a long-run positive causality and short-run co-integration relationship between industrial production and Islamic banks credits that provide to the private sector.

C(1) is also the speed at which the series deviates from equilibrium to return to equilibrium. Since *C(1)* calculated in this study is statistically significant and

negative (*-0.531383*), it is expected that a re-equilibrium orientation occurs in the face of departures from long-run balance. Approximately *53%* of deviations are corrected when there is a departure from balance. Since *C(1)* is negative and significant, it can be mentioned that there is a long-run causality relationship from the Islamic bank credits to industrial production.

Table 11: Normalized Equation and Error Correction Model

Industry(-1)	1.000000
Islamic(-1)	-0.314241
	(0.02158)*
	[-14.5586]
C	0.483511
Industry = -0.00222+0.314241LKATILIM	
Error Correction Model	
D(Industry) = C(1)*(Industry (-1) - 0.314240522725* Islamic (-1) + 0.483511326397) + C(2)*D(Industry (-1)) + C(3)*D(Industry (-2)) + C(4)*D(Islamic (-1)) + C(5)*D(Islamic (-2)) + C(6)	
EC_t= -0.531383*[-5.43966], *%5 significance	

To determine short-term causality, the equation *C(4)=C(5)=0* was tested using the Wald test using the coefficients in the error correction model. According to Table 12, the H_0 hypothesis suggests that *C(4)=C(5)=0* was rejected. Therefore, it was concluded that there is also a short-run causality relationship from the Islamic bank credits to industrial production.

Table 12: Wald Test

Test Statistic	Value	df	Probability
F-statistic	4.019741	(2, 139)	0.0201
Chi-square	8.039481	2	0.0180

4.3.2 Variance Decomposition

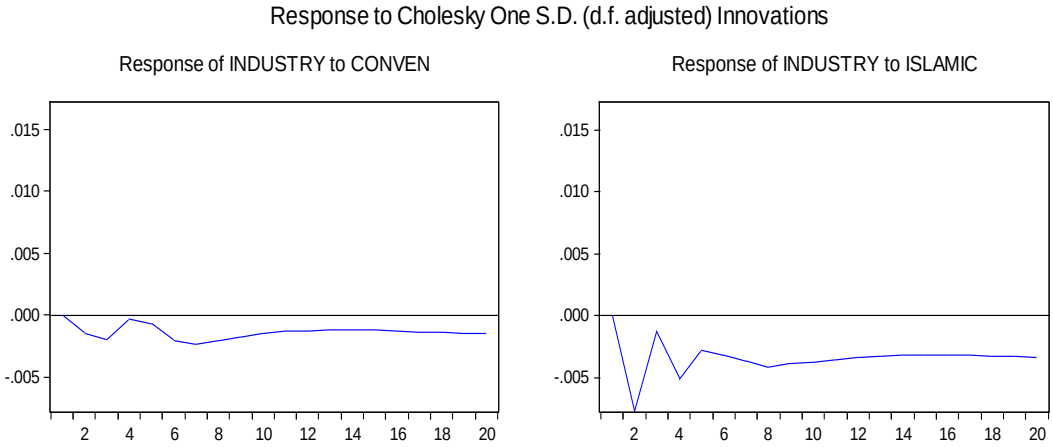
Table 13 shows the impact of a shock caused by industrial production on the current and future values of the variable funds provided by Islamic banks to the real sector. By the variance decomposition method, the effect of the loan provided by Islamic banks on industrial production was tested for ten periods. A change in industrial production originates only from itself (other factors that can affect industrial production except for Islamic banks) in the first period. In this sense, it can be said that Islamic banks did not affect industrial production in the first period. However, after the second period, the effect originating from Islamic banks emerges and increases over the periods. As a result, the effect of the change in credits on industrial production increases over time. However, compared to traditional banks, it is seen that Islamic banks have a more significant influence on industrial production.

Table 13: Variance Decomposition Results

Variance Decomposition of Industry: Period	S.E.	Industry	Islamic
1	0.039306	100.0000	0.000000
2	0.042187	96.47104	3.528957
3	0.043368	96.49130	3.508702
4	0.043752	96.48950	3.510495
5	0.043945	96.48383	3.516165
6	0.044053	96.34717	3.652829
7	0.044153	96.03337	3.966629
8	0.044268	95.57254	4.427459
9	0.044405	94.98673	5.013272
10	0.044564	94.30828	5.691721

4.3.3 Impact-Response Function

In this part, impulse-response functions among variables were tried to be calculated with the help of VECM. As a result of the co-integration test, VECM was used instead of the standard VAR model since there is a long-term, stable relationship between the variables. The impulse-response functions reflect the effect of a standard deviation shock in one of the random error terms on the present and future values of the internal variables. Also, it gives an idea about the use of the influencing variable as a policy tool. Graph 6 displays impulse-response functions showing the effect of a shock in the industrial production variable on other variables for the error correction model. According to the impulse-response functions, the variables represented by traditional bank loans and participation bank loans in the analysis period negatively react from the first moment to industrial production shock.



Graph 6: Response of Endogenous Variables to Industrial Production

5. Conclusion and Discussion

The economists and financiers reveal the relationship between financial development and economic growth at different levels from different perspectives. The first examples of these studies focus more on the effect of financial development on economic growth. However, some studies focused more specifically on the effects of banking and market-based financial systems, typical examples of financial systems, on economic growth. The development of financial systems and financial institutions within these systems indicates how economically powerful countries are. The diversity of institutions in the financial system and the instruments they offer, and the level of preference impact countries' economic growth. The financial liberalization process and financial integration brought about the deepening of the financial markets of the countries. The deepening financial factor contributes significantly to economic growth by transferring funds created in the economic system to the real sector. However, suppose the financial deepening in a financial system cannot be achieved at the desired or sufficient level. In that case, only a small part of the funds created in that economy will be transferred to the real sector, and in this case, economic growth will occur at lower rates due to the lack of resources in the real sector. Increasing the created funds (savings) or capital accumulation and utilization usually occurs through the banks in that economy.

On the other hand, the increase in bank loans will increase the demand for goods and services produced in the economy. As a result, an increase in inflation levels will occur. Volatility observed in inflation and interest rates thoughtfully and negatively affect the credit market. Since the banks generally provide the banks' domestic debt requirement, the banks' loan supply will narrow, and the total fund supply of that economy will decrease (Korkmaz, 2015:67). On the other hand, Friedman (1969) emphasized that nominal interest rates must be zero for optimal resource allocation.

Today, there is the dual banking system in many developed and developing countries. Islamic financial institutions also operate in many countries where traditional banking and financial systems prevail. On the other hand, different applications are also seen, such as dual banking models, Islamic banking activities that are subsidiaries of traditional banks, or Islamic banking windows of traditional banks (El-Galfy & Khiyar, 2012:943). This diversity of the banking sector is getting more and more attention in the academic field. As can be seen in the main fields of activity of conventional banks, the main activity of Islamic banks is to mobilize the funds of the savers and deliver them to economic actors (companies, individuals, public institutions) in need of funds. Various theoretical studies have been conducted in different fields of Islamic banking. The theoretical models developed show that the Islamic financial system, which is heavily

dependent on financial instruments, is superior to the traditional financial system in terms of equity stability and efficiency (Goaied & Sassi, 2010:2).

In addition to numerous studies emphasizing the theoretical importance of financial institutions in the economic growth process, the number of empirical studies conducted to test this relationship has increased significantly in the last 15-20 years. In this study, the effect of Islamic and conventional banks credits on industrial production, which is also accepted as an economic growth indicator, was examined. The co-integration and causality relationships were investigated between industrial production and financing provided by Islamic banks and conventional banks to the real sector. The co-integration test results show that conventional and Islamic bank credits and industrial production series move together in the long-run. According to the VECM results, there is a long-run causality relationship between series. Wald test results indicate that there is no short-term causal relationship between conventional bank credits and industry production. However, there is a short-run causality relationship from the Islamic bank credits to industrial production.

The variance decomposition analysis shows that a change in industrial production originates only from itself (excluding traditional banks, other factors that may affect industrial production) in the first period. Therefore, traditional banks did not affect industrial production at all in the first period. However, after the second period, the effect originating from traditional banks emerges and increases over the periods. Thus, the effect of the change in credits on industrial production increases over time. The study also looked at impulse-response functions. In the analysis period, traditional bank loans and participation bank loans negatively react from the first moment to industrial production shock.

The findings of this study is consistent with the finding of studies conducted by Gurley & Shaw (1955), Cottarelli et al. (2003), Alfaro et al. (2004), Rondorf (2012), Rahimzadeh (2012), Muchingami, Monametsi & Paradza (2017), Ogunmuyiwa, Okuneye & Amaefule (2017), Vestman & Viebroc (2018), Tongurai & Vithessonthi (2018), Botev, Égert & Jawadi (2019), Elijah (2019), Boukhatem & Moussa's (2018) ve Bougatef, Nakhli & Mnari (2020).

However, it contradicts the findings of studies by researchers such as Andabai & Eze (2018) and Ergec & Selcik (2020).

Panel data analysis can be performed over larger panel data sets by using the data of different countries together in subsequent studies. In addition, more detailed analyzes can be developed on the basis of macroeconomic indicators and comparative analyzes can be made by considering developed and developing countries separately.

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