

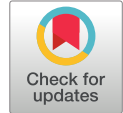
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Financial Institutions Association Economic Outlook Index as a Leading Indicator of Real Economic Activity: A Time Series Analysis for Türkiye



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Abstract

This study tests whether the Economic Outlook Index (FKB-EGE) published by the Financial Institutions Association (FKB) serves as a leading indicator for real economic activity in Türkiye using time series analysis methods. The FKB-EGE index, which is based on actual transaction data from factoring, financial leasing, and financing companies, differs from survey-based indicators in that it is constructed using data directly linked to real economic activity. In this study, the Industrial Production Index (IPI) published by the Turkish Statistical Institute (Turkstat) was used as an indicator of real economic activity. The analysis includes a time series of 124 periods covering monthly data from February 2015, when the FKB-EGE was first calculated, to May 2025. The findings obtained from the Granger causality tests and forecasting regression models applied indicate that FKB-EGE, and particularly the Financial Leasing sub-index, provide statistically significant and economically important information in forecasting the future trend of the IPI. The superior performance of the Financial Leasing Index in medium-term (3–6 months) forecasts aligns with theoretical expectations that leasing activities, which reflect investment decisions, serve as an important early warning signal for future production activity. These results suggest that the FKB-EGE could serve as a valuable real-time monitoring tool for policymakers and market analysts.

Keywords

Leading Indicators • FKB Economic Outlook Index • Industrial Production Index • Time Series Analysis • Granger Causality



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Extended Summary

Objective and Motivation: This study investigates the potential of the Economic Outlook Index (FKB-EGE), published by the Financial Institutions Association (FKB), to serve as a leading indicator for real economic activity in Türkiye. Unlike traditional survey-based indices reliant on expectations or sentiment, the FKB-EGE is constructed from actual transaction-level data from factoring, financial leasing, and financing companies. Given the growing importance of timely and reliable indicators in economic decision-making, particularly in volatile emerging markets like Türkiye, this study fills a crucial gap in the literature by evaluating the predictive power of non-bank financial institution (NBFI) activities using a data-driven, empirical methodology.

Data and Methodology: The empirical analysis uses monthly data spanning from February 2015 to May 2025, with the Industrial Production Index serving as a proxy for real economic activity. Three subindices of the FKB-EGE are examined individually: factoring, financial leasing, and financing. Standard time series econometric techniques are applied, including stationarity tests (ADF and KPSS), Granger causality analysis, and both in-sample and out-of-sample forecasting regressions. A particular focus is given to assessing the marginal forecasting power of the FKB-EGE and its sub-indices beyond the autoregressive structure of the IPI itself.

Key Findings: The empirical results confirm that the FKB-EGE index—especially the Financial Leasing sub-index—provides statistically significant and economically meaningful predictive information for forecasting industrial production in Türkiye. Granger causality tests show that both the composite FKB-EGE and the Financial Leasing sub-index Granger-cause IPI growth at the 5% and 1% significance levels, respectively. The factoring sub-index also exhibited significance at the 10% level, whereas the financing sub-index did not demonstrate significant causality.

Forecast regression models further underscore the index's predictive strength. In-sample analysis reveals that the Financial Leasing sub-index is most effective in forecasting medium-term (3–6 months ahead) changes in industrial production, consistent with the theoretical role of leasing as a proxy for investment decisions. Factoring shows greater effectiveness in the short term (1 month), reflecting its connection to working capital and commercial activity. Out-of-sample forecasting confirms these results: models incorporating the FKB indices outperform autoregressive benchmarks, with the Financial Leasing sub-index reducing forecast errors by up to 15% at a 3-month horizon.

Theoretical Contribution: The findings are grounded in the financial accelerator framework, which posits that financial conditions can amplify economic cycles through their influence on investment and production decisions. The Financial Leasing index, which captures contractual commitments for fixed capital investments, serves as a direct proxy for business sentiment and future capacity expansion. Meanwhile, the factoring index captures short-term liquidity and production momentum, which is particularly relevant for SMEs. These mechanisms validate the economic significance of FKB-EGE beyond mere statistical correlation.

Policy Implications: The FKB-EGE can serve as a valuable, real-time monitoring tool for policymakers, notably the Central Bank of the Republic of Türkiye and the Ministry of Treasury and Finance. It offers a timely alternative to lagging indicators like GDP and can help detect turning points in economic activity earlier. Moreover, the index may contribute to financial stability monitoring, as abrupt changes in NBFI activity—especially in leasing and factoring—can signal vulnerabilities in SME financing and broader economic sentiment.

Limitations and Future Research: The main limitation of this study lies in the relatively short time series of the FKB-EGE, restricting long-term validation across multiple business cycles. Future research could extend the analysis by incorporating other macroeconomic variables or integrating FKB-EGE with soft data sources to form a composite indicator.

Conclusion: This study presents robust empirical evidence that the FKB Economic Outlook Index—particularly its Financial Leasing subcomponent—acts as a leading indicator of real economic activity in Türkiye.

Financial Institutions Association Economic Outlook Index as a Leading Indicator of Real Economic Activity: A Time Series Analysis for Türkiye

The importance of timely and reliable indicators regarding the future course of real activity in economic decision-making processes is increasing. This study examines the potential of the Economic Outlook Index (FKB-EGE) published by the Financial Institutions Association (FKB) based on actual economic transactions in this area. In the subsequent sections of the study, various econometric methods are employed to examine whether this index serves as a leading indicator of the Turkish economy.

While it is important for all economies to accurately predict the trends in real economic activity in a timely manner, this is even more critical for developing economies like Türkiye, which have high growth potential but are also sensitive to internal and external shocks. Predicting turning points in economic activity trends in advance provides a basis for decision-makers and implementers, particularly institutions such as the Central Bank of the Republic of Türkiye (CBRT) and the Ministry of Treasury and Finance, to mitigate the negative effects of cyclical fluctuations (Atabek, Coşar, and Çevik 2005).

Similarly, leading indicators of future economic conditions for firms operating in the real sector enable them to reduce uncertainty and make investment, production, and employment plans on a more solid foundation. (Ozbilgin, 2017). In this context, the identification of leading economic indicators that provide early warnings about the future direction of economic activity are indispensable tools for both public and private sector decision-makers.

In this context, the identification and use of leading economic indicators that provide early warnings about the future direction of economic activity are indispensable tools for both public and private sector decision-makers. However, the reliability and timeliness of these indicators are critical issues, especially in an environment with high macroeconomic volatility, such as Türkiye. Indicators can generally be divided into "hard data," which is based on actual economic transactions, and "soft data," which is survey-based and measures expectations, intentions, or confidence (Leigh and Rossi, 2002). While soft data may have advantages due to their faster publication speeds, they can produce noisy and misleading signals, especially during periods of uncertainty, as they are susceptible to sudden changes in market sensitivity.

Numerous institutional and individual studies have been conducted to develop and identify leading indicators of the Turkish economy. In the literature, various potential indicators, such as survey-based indicators like the Central Bank of the Republic of Türkiye (CBRT) Real Sector Confidence Index, import and export volume indices, credit sizes, and financial market variables have been analysed for this purpose (Altuğ and Uluceviz, 2011; Canöz, 2018) .

However, a significant portion of these indicators are based on data reflecting expectations and intentions or refer to macroeconomic data, such as GDP, which are comprehensive but published at low frequency and with significant delays. Due to the aforementioned structural characteristics, these indicators lack the real-time and concrete economic transaction-based indicators required by decision-makers.

At this point, the Economic Outlook Index (FKB-EGE), developed by the Financial Institutions Association (FKB) in collaboration with Istanbul University and published monthly, has the potential to fill an important gap. The key distinguishing feature of the FKB-EGE is that it is calculated based on data derived directly from actual economic transactions, rather than surveys or expectations. The index is based on data from the Central Invoice Registration System (MFKS), which records commercial receivables and payment instruments assigned to factoring companies and banks, with over 51 million documents, and the Financial Leasing Contracts Registration System (FKSTS), which records financial leasing contracts signed by financial leasing

companies, participation, investment, and development banks, with over 236,000 contract registration data, providing data on the transaction volume and number of contracts in the financial leasing sector. (FKSTS), which records financial leasing contracts signed by financial leasing companies, participation, investment, and development banks, is calculated based on data from MFKS and FKSTS (Sırma et al., 2025).

Factoring transactions covered under FKB-EGE reflect the financing of trade receivables and, consequently, the working capital cycle of firms, while financial leasing transactions are a direct indicator of fixed capital investments such as machinery and equipment. This structure grants the FKB-EGE the potential to reflect the foundations of the real economy, particularly the economic activities and investment trends of SMEs that heavily rely on these financing methods.

The primary literature gap addressed in this study is the insufficient exploration of the potential of **non-bank financial institutions' (NBFI)** actual transaction data in forecasting real economic activity in Türkiye. Services such as factoring and financial leasing are critical financing sources for SMEs, particularly those with more limited access to traditional bank loans (Klapper, 2006; Kraemer-Eis & Lang, 2012). Additionally, the increasing role of **NBFIs** in the global financial system and their recognition as potential sources of systemic risk since the 2008 Global Financial Crisis have made monitoring their activities a matter of foresight and financial stability (Financial Stability Board, 2022; Aramonte et al., 2022).

The main objective of this study is to empirically test whether FKB-EGE has a statistically significant explanatory power in predicting future movements of real economic activity measured by the Industrial Production Index in Türkiye. In line with this main objective, the research questions of this study are as follows.

- Are FKB-EGE and its sub-indices a Granger cause of industrial production index (IPI) growth?
- Does FKB-EGE provide additional predictive content beyond its own past values for IPI growth?
- Which sub-index of FKB-EGE (Factoring, Financial Leasing, and Financing) is more powerful in predicting real activity?
- Does the index's predictive power remain stable over time (e.g., pre- and post-pandemic periods)?

Original Contribution and Structure of the Study

This study aims to create original added value in three key areas. These are in order: To empirically test the validity of the FKB-EGE index, which is based on actual real transactions, for the Turkish economy; to demonstrate the leading role of non-bank financial sector activities in the real economy, particularly through investment and working capital channels; and to introduce a new and complementary tool for policymakers and market analysts to monitor economic activity in real time.

To this end, the second section of the study evaluates the conceptual framework related to leading indicators, presents studies conducted on Türkiye, and outlines the theoretical framework explaining the interaction between the financial sector and the real economy. The third section explains the dataset used in the analysis and details the econometric methodology used in the analysis. The fourth section presents and discusses the empirical findings obtained from the analysis. The fifth and final section summarises the results, highlights limitations, and proposes policies.

Literature Review and Theoretical Framework

This section examines the basic concepts related to leading indicators and business cycle cycles that form the theoretical basis of the study, summarises previous studies specific to the Turkish economy, and discusses the theoretical channels of financial and real sector interactions that explain the potential leading role of FKB-EGE.

Leading indicators and the business cycle: Theoretical Background

Leading economic indicators are time series used to predict fluctuations in economic activity, particularly turning points (peaks and troughs) (Zarnowitz, 1992). The first studies in this field are based on the work of Mitchell and Burns at the National Bureau of Economic Research in the United States (Mitchell W.C& Burns, 1938) . These studies revealed that economic cycles are formed by the simultaneous movement of various macroeconomic series, with some series tending to move ahead of (leading), some simultaneously with (coincident) (Moore, 1961), and others following (lagging) general economic activity.

Individual leading indicators may contain idiosyncratic shocks and noise, thereby carrying the risk of producing false signals. To address this issue, organisations such as the Organisation for Economic Cooperation and Development (OECD) have developed methodologies to create composite leading indicators (CLIs) by combining multiple leading indicators. (Gyomai & Wildi, 2012) . These indicators aim to provide a more reliable and comprehensive signal by combining a set of indicators reflecting different economic processes (demand, supply, and financial conditions) into a single index. (Gallegati, 2014) .

Leading Indicators Developed for the Turkish Economy

Efforts to develop leading indicators of the Turkish economy have followed a parallel development with the international literature. The initial studies conducted by Atabek et al. established a composite leading indicator index for Türkiye based on the OECD methodology (Atabek et al., 2005). The findings of these studies reveal that variables such as intermediate goods imports, government bond interest rates, real sector confidence index, and manufacturing industry capacity utilisation rates possess leading characteristics.

In recent studies, the methodology popularised by Stock and Watson (2003), which aims to select the best indicators based on out-of-sample forecasting performance from a broad set of potential indicators, has been frequently preferred (Stock & Watson, 2003) . For example, studies such as Leigh and Rossi (2002) and Altuğ and Uluceviz (2011) have tested a wide range of variables, including asset prices, interest rates, and survey indicators, for forecasting real activity and inflation in Türkiye. (Altug & Uluceviz, 2011; Leigh & Rossi, 2002) .

Özbilgin (2017) defined Türkiye's growth and developed a new composite leading indicator to predict the turning points of these cycles (Ozbilgin, 2017) . Other studies have examined the negative effects of uncertainty on investment and consumption by creating economic uncertainty indices (Arslan et al., 2015) or modelling stress propagation between different sub-segments of financial markets (Camlica et al., 2017).

A key point frequently emphasised in these studies is that variables reflecting financial conditions and expectations have significant predictive power for macroeconomic variables. However, these studies have not been conducted using a dataset containing actual transaction data from the non-banking financial sector, as is the case with FKB-EGE. Therefore, this study expands the existing literature with a new and original dataset.

Theoretical Framework: Financial Sector and Real Economy Interaction

The fundamental economic mechanisms explaining the potential of FKB-EGE as a leading indicator of real economic activity are based on financial intermediation theory, particularly the financial accelerator mechanism. This theory explains how developments in financial markets amplify and spread shocks in the real economy. (Bernanke, Gertler, and Gilchrist, 1999; Bernanke and Gertler, 1989; Bernanke, 1983). At the core of the financial accelerator theory lies asymmetric information between lenders and borrowers and the resulting information costs (Stiglitz and Weiss, 1981; Holmstrom and Tirole, 1997; Ćorić, 2011).

Non-bank financial institutions, such as financial leasing, factoring, and financing companies, have emerged as a critical source of financing, particularly for SMEs that may have more limited access to traditional bank loans. According to the financial accelerator mechanism, during periods of economic expansion, firms' balance sheets and collateral values improve. This situation reduces borrowing costs and eases credit access, thereby encouraging firms to make more investments and increase production, which accelerates economic growth (Bernanke et al., 1999). Conversely, during economic downturns, weakened balance sheets tighten credit conditions and deepen the decline in economic activity (Bernanke et al., 1994). Since FKB-EGE directly measures changes in these financing flows, it can generate a signal before the financial accelerator mechanism reflects on the real economy. An increase in the index could provide a serious indication that firms have easier access to financing and that future investment and production decisions are shaping up positively.

The Financial Leasing Index, a subcomponent of the FKB-EGE, is based on contracts made by companies to finance machinery, equipment, and other durable production goods. This is a direct component of gross fixed capital formation, i.e., private sector investments. Since investment decisions are made based on future expectations and investment projects take time to materialise, an increase in financial leasing contracts has the potential to serve as a strong leading indicator of future production capacity and economic activity growth. Another subcomponent, the factoring index, is based on companies transferring their receivables from commercial transactions to a factoring company in exchange for immediate cash. This process accelerates the working capital cycle of companies, improves cash flow, and ensures uninterrupted production. An increase in factoring volume can be interpreted as an early sign of a revival in commercial activity and an increase in companies' capacity to finance short-term production. The third component of the FKB-EGE, the Finance Sector Index, primarily reflects credit activities targeting individual consumers. Finance companies provide direct credit to consumers to finance the purchase of durable consumer goods, such as vehicles, housing, and white goods, as well as various services. An increase in consumer credit may indicate a revival in future demand and retail sales. This channel is thought to be closely related to consumer confidence and spending trends and to provide information about the demand-side dynamics of the economic cycle.

These theoretical channels demonstrate that FKB-EGE can be a statistical correlation and a leading indicator based on a solid economic foundation.

Data Set and Econometric Methodology

This section presents the definition and sources of the data used in the study and provides a detailed explanation of the econometric methods used in the empirical analysis. The analysis is based on the Industrial Production Index, which represents real economic activity, and the Economic Outlook Index and its sub-indices published by FKB.

Data Definition and Sources

All data used in this study are monthly in frequency and cover the period from February 2015, the starting date of the FKB-EGE data, to the latest available data as of May 2025.

Dependent variable (real activity indicator)

- **Main Variable:** As the primary indicator of real economic activity, the Monthly Industrial Production Index (2021 = 100) published by the Turkish Statistical Institute (Turkstat) has been used. The Industrial Production Index is an important indicator that measures the monthly change in the production volume of the industrial sector (such as mining, manufacturing, electricity, gas, and steam production) of the economy. The fact that the IPI is published monthly and has a shorter publication lag relative to the gross

domestic product (GDP) makes it a more suitable and timely reference series for business cycle analysis. In the analysis, the seasonally and calendar-adjusted series of the indexes was preferred. To ensure the stationarity of the series and measure the monthly growth rate, the logarithmic difference in the series was taken to create the following variable:

$$IIP_{growth_t} = \ln(IIP_t) - \ln(IIP_{t-1}) \quad (1)$$

The variable has been created.

In this equation, represents the industrial production index for period t, while the variable denotes the logarithmic growth rate of the index relative to the previous month.

- **Control variable:** To test the robustness of the findings, the Quarterly Gross Domestic Product (GDP) (2009 = 100) data published by the Turkish Statistical Institute (Turkstat) was used.

Independent Variables

- The independent variables forming the basis of the analysis are the FKB Economic Outlook Index (FKB-EGE) published by the Financial Institutions Association (FKB) and its three sub-indices: the FKB Factoring Sector Index, the FKB Financial Leasing Sector Index, and the FKB Financing Sector Index. All index data were obtained from the FKB's Economic Outlook Index Bulletin dated June 2025.

Econometric Methodology

The analysis was conducted following the standard procedures of time series econometrics as outlined below.

Stationarity Analysis

Testing the stationarity levels of time series is a critical first step to avoid spurious regression problems and determine the appropriate model specification. In this study, the stationarity properties of all time series (IPI) growth, FKB-EGE, and sub-indices) will be examined using the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test, where the null hypothesis is that the series is "stationary," and the Augmented Dickey-Fuller (ADF) test, where the null hypothesis is that the series contains a unit root. (ADF) test, where the null hypothesis is "the series contains a unit root," and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test, where the null hypothesis is "the series is stationary."

It is expected that the FKB indices exhibit non-stationarity at their levels (I(1)) but become stationary when their first differences are taken (I(0)). In this case, the differences of the indices will be used instead of their levels in regression analyses.

Granger causal analysis

The Granger (1969) causality test is a standard method for determining whether one variable contains meaningful predictive information about another variable. In this study, a vector autoregressive (VAR) model framework will be used as a standard application of the causality test developed by Granger (1969) to test whether FKB-EGE (and its sub-indices) Granger causes IPI growth. The equations to be tested are as follows:

$$IIP_{growth_t} = \alpha_1 + \sum_{i=1}^p \beta_{1i} IIP_{growth_{t-i}} + \sum_{i=1}^p \gamma_{1i} \Delta FKB_{EGE_{t-i}} + \epsilon_{1t} \quad (2)$$

$$\Delta FKB_{EGE_t} = \alpha_2 + \sum_{i=1}^p \beta_{2i} IIP_{growth_{t-i}} + \sum_{i=1}^p \gamma_{2i} \Delta FKB_{EGE_{t-i}} + \epsilon_{2t} \quad (3)$$

Here, the null hypothesis to be tested is that the past values of FKB-EGE do not explain IPI growth.

$$H_0 : \gamma_{1i} = 0 \quad (4)$$

This hypothesis will be statistically rejected if it is found that FKB-EGE does not explain IPI growth.

Forecasting regression models

Forecast regressions were estimated to quantitatively measure the marginal forecasting power of FKB-EGE and determine whether IPI growth provides additional information beyond its own past values. This approach is consistent with the methodology used in studies such as Stock and Watson (2003).

- **Model 1 (Benchmark AR Model):** This model explains IPI growth solely using its past (autoregressive) values.

$$IIP_{growth_{t+h}} = \alpha + \sum_{i=1}^p \beta_{1i} IIP_{growth_{t-i}} + u_{t+h} \quad (5)$$

- **Model 2 (Extended AR-X Model):** This model adds the lagged value of the FKB-EGE (or its sub-indices), which is a candidate leading indicator, to the benchmark model.

$$IIP_{growth_{t+h}} = \alpha + \sum_{i=1}^p \beta_{1i} IIP_{growth_{t-i}} + \delta \Delta FKB_{EGE_t} + u_{t+h} \quad (6)$$

In these equations, h represents the forecast horizon (e.g., $h = 1, 3, 6$ months). The focus of the analysis is to examine whether the δ coefficient is statistically significant and whether Model 2 improves the forecasting performance compared to Model 1.

In-sample performance will be evaluated using R^2 values, while out-of-sample performance will be assessed by comparing root mean squared error (RMSE) metrics calculated using recursive or rolling prediction windows.

Empirical Findings and Discussion

This section presents the empirical findings obtained using the methodology described above and interprets these findings within an economic framework.

Descriptive statistics and stationarity test results

Before starting the analysis, the basic statistical properties and stationarity levels of the variables were examined. Table 1 summarises the descriptive statistics and unit root test results for the variables from February 2015 to May 2025.

Table 1

Descriptive statistics and unit root test results

Variable	obs.	mean	Std. Dev.	Min.	Max.	ADF	KPSS	Result
SUE Growth	124	3	28	-88	123	-9.87***	0.15	I(0)
FKB-EGE (Level)	124	100.15	2.35	95.15	106.90	-2.14	0.89**	I(1)
Δ FKB-EGE	123	5	1.21	-3.09	3.15	-11.52***	0.21	I(0)
FKB-Factoring (Level)	124	100.58	1.88	95.85	103.59	-2.55	0.76**	I(1)
Δ FKB-Factoring	123	1	1.35	-4.63	4.63	-10.98***	0.19	I(0)
FKB-Financial Leasing (Level)	124	100.21	4.12	88.82	106.90	-1.89	0.95**	I(1)
Δ FKB-Financial Leasing	123	18	2.56	-5.88	5.88	-9.91***	0.25	I(0)
FKB-Finance (Level)	124	99.87	3.21	94.75	106.52	-2.31	0.81**	I(1)
Δ FKB-Financing	123	-3	1.98	-3.49	04.08	-10.15***	0.22	I(0)

Note: *** indicates significance level of 1%.

MacKinnon critical values were used for the ADF tests, and a 5% critical value (0.463) was used for the KPSS test

The results in Table 1 are consistent with expectations. The IPI growth series is stationary at the level according to both the ADF and KPSS tests. In contrast, the level series of FKB-EGE and its three subindices fail to reject the unit root hypothesis in the ADF test and the stationarity hypothesis in the KPSS test. This indicates that these series exhibit non-stationarity. However, when the first differences in the series are

taken, all indices become stationary at the 1% significance level. This finding necessitates the use of the first differences in the FKB indices in subsequent analyses.

Granger Causality Test Results

Granger causality tests were conducted to determine whether the FKB indices contain statistically significant information in predicting industrial production growth. The appropriate lag length was determined to be 2 based on information criteria. The results are summarised in Table 2.

Table 2

Granger Causality Test Results (Dependent Variable: IPI Growth)

Null Hypothesis (H_0)	F-Statistic	"P" Value	Result
Δ FKB-EGE is not a Granger cause of IPI growth	4.1	0.018**	H_0 Rejected
Δ FKB-factoring is not a Granger cause of IPI growth	2.89	0.061	H_0 Rejected
Δ FKB-Financial Leasing is not a Granger cause of IPI growth	5.02	0.008***	H_0 Rejected
Δ FKB-Financing is not a Granger cause of IPI growth	1.98	1	H_0 Cannot be rejected.

Note: **, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

The test results support the hypothesis that FKB-EGE Granger causes IPI growth. The null hypothesis for the composite index (FKB-EGE) is rejected at the 5% significance level. When examining the subindices, the strongest causal relationship is observed between the Financial Leasing index and industrial production growth (at the 1% significance level). The factoring index also exhibits a statistically significant causal relationship at the 10% level, whereas no statistically significant Granger causality was found between the Finance sector index and industrial production growth. These findings provide evidence that the FKB-EGE, particularly its Financial Leasing component reflecting investment expenditures, contains important information about future industrial production movements.

Forecasting regression results

Following the Granger causality tests, in-sample and out-of-sample forecasting analyses were conducted to quantitatively measure the marginal forecasting power of the FKB indices.

In-Sample Findings

Table 3 presents the forecasting regression results showing the effect of FKB indices on IPI growth for 1, 3, and 6-month forecasting horizons. Each model includes two lags of IPI growth as control variables.

Table 3

In-Sample Forecasting Regression Results for IPI Growth

Forecast Horizon (h)	Variable	Coefficient (δ)	t-statistic	Adjusted R^2
h=1 month	Δ FKB-EGE	2	2.51**	0
	Δ FKB-Factoring	21	2.15**	0.16
	Δ FKB-Financial Leasing	15	1.88	0.15
h=3 months	Δ FKB-EGE	3	2.89***	0.22
	Δ FKB-Factoring	19	1.76*	0.14
	Δ FKB-Financial Leasing	29	3.11***	0.24
h=6 months	Δ FKB-EGE	25	2.05**	0.17
	Δ FKB-Factoring	11	1.05	0.11
	Δ FKB-Financial Leasing	24	2.67***	0

Forecast Horizon (h)	Variable	Coefficient (̢)	t-statistic	Adjusted R ²
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Note: **, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

All regressions include two lags of IPI growth.

In-sample results indicate that FKB indices play a significant role in predicting IPI growth.

- **Short Term (h = 1 month):** In forecasts for 1 month ahead, the composite index and factoring index have significant and positive coefficients at the 5% level. This indicates that the revival in commercial activity and working capital is reflected in industrial production in the following month.
- **Medium Term (h = 3.6 months):** As the forecast horizon extends, the importance of the financial leasing index becomes increasingly evident. In forecasts for 3 and 6 months ahead, the financial leasing index's coefficient is significant at the 1% level. This aligns perfectly with the theoretical expectation that an increase in leasing transactions, which reflect investment decisions, manifests itself as production growth in the medium term. The fact that the factoring index becomes insignificant at the 6-month horizon confirms that this index captures short-term dynamics more effectively.

Out-of-Sample Performance

The true utility of a leading indicator is best assessed by its ability to accurately forecast out-of-sample values—that is, observations not used in model estimation. For this purpose, the first 70% of the analysis period (2015–2022) was taken as the initial forecast period, and out-of-sample forecasts for 1, 3, and 6 months ahead were generated using the rolling window method. Table 4 shows the relative performance of the extended models (AR-X) containing FKB indices compared to the benchmark AR model, which uses only its own past data (), in terms of root mean square error (RMSE) ratio. A ratio of less than 1 indicates that the extended model has superior forecasting performance.

Table 4

Out-of-Sample Forecasting Performance Comparison (RMSE Ratio: RMSE(AR-X)/RMSE(AR))

Forecast Horizon (h)	ΔFKB-EGE	ΔFKB-Factoring	ΔFKB-Financial Leasing
h=1 month	0.92	0.94	0.98
h=3 months	0.88	0.96	0.85
h=6 months	0.91	1.02	0.89

Note: Values less than 1 indicate that the addition of the FKB index improves predictive accuracy.

Out-of-sample results strongly support the in-sample findings. The FKB-EGE composite index outperformed the benchmark model across all forecast horizons, reducing forecast errors by 8%–12%. The most notable performance belongs to the Financial Leasing index. This index has proven to be the strongest and most stable leading indicator, reducing prediction errors by 15% at the 3-month forecast horizon and 11% at the 6-month horizon. These findings demonstrate that FKB-EGE represents not only a statistical relationship but also a tool with practical predictive value in the real world.

Evaluation of the Findings

The findings strongly support the hypothesis that the FKB-EGE, particularly the Financial Leasing sub-index, serves as a valuable leading indicator of real economic activity in Türkiye. The Financial Leasing index's prominence in medium-term forecasts aligns with the theoretical framework that this index reflects firms' investment decisions and that these decisions take a certain amount of time to translate into production. The factoring index's effectiveness in the short term indicates that this index captures more immediate economic dynamics, such as commercial activity and working capital.

Conclusions and policy recommendations

In the final section of the study, the key findings from the empirical analysis are summarised, implications for policymakers and market actors are presented based on these findings, and finally, the limitations of the study and recommendations for future research are discussed.

This study examines the potential of the FKB Economic Outlook Index (FKB-EGE) as a leading indicator for real economic activity in Türkiye using time series analysis methods for the period 2015-2025. This "hard data"-based index, which is based on millions of actual transactions in the factoring, financial leasing, and financing sectors, is highlighted as having a unique structure compared to traditional survey-based indicators.

Empirical analysis results strongly confirm this potential. Granger causality tests have shown a statistically significant causal relationship between the FKB-EGE and its sub-indices (excluding Finance) and the growth of the Industrial Production Index. Forecasting regression analyses have demonstrated that this relationship is both economically meaningful and practically useful. In particular, the Financial Leasing sub-index has demonstrated the strongest and most stable performance in predicting IPP growth in 3- to 6-month medium-term forecasts, reducing out-of-sample forecast errors by up to 15%. This finding aligns with the theoretical expectation that leasing activities, which reflect investment decisions, serve as an important early warning signal for future production activity.

The findings of this study have important implications for policymakers and market analysts.

- **For the Central Bank and Economic Management:** FKB-EGE is a valuable complementary indicator that can be used to monitor the course of economic activity in real time, providing input for monetary and fiscal policy decisions. The index can provide an early signal about the current state of the economy and its near-term direction, particularly without waiting for the release of low-frequency data, such as GDP. A sharp and sustained decline in the index could be interpreted as an early warning of an economic slowdown, helping to design proactive policy responses.
- **For Financial Stability:** The index reflects the stability and activity of the non-bank financial sector, which is closely linked to the real economy. Excessive overheating or sudden contractions in this sector may pose potential risks to financial stability (Acharya & Richardson 2009). Therefore, the trend of the FKB-EGE can be used as an input in financial stability analyses and within the macroprudential policy framework by the CBRT and other regulatory authorities.

Like any empirical study, this study has certain limitations. The most significant limitation is the relatively short time series (approximately 10 years) of the FKB-EGE. This limitation limits the analysis of long-term relationships, performance across multiple business cycles, and structural breaks.

Considering these limitations, the following areas are recommended for future research:

- Recent academic studies have shown that the time series frequency of data (monthly vs. quarterly) can significantly affect model results (Feroni, Gelain, and Marcellino, 2022). Repeating the analyses in this study for a longer sample period would increase the robustness of the findings.
- The predictive power of FKB-EGE can also be tested for other important macroeconomic variables, such as employment, private consumption expenditures, or private sector fixed capital investments.
- FKB-EGE can be combined with the data from the "Economic Outlook Expectation Survey" published in the bulletin to create a more comprehensive composite indicator that includes both "hard" and "soft" data.



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