European Journal of Government and Economics

Vol.9 • No.1
2020
ISSN: 2254-7088

Servizo de Publicacións
UNIVERSIDADE DA CORUÑA

European Journal of Government and Economics

ISSN: 2254-7088

Number 9, issue 1, June 2020

DOI: https://doi.org/10.17979/ejge.2020.9.1

European Journal of Government and Economics

ISSN: 2254-7088

Do confidence indicators have an impact on macro-financial indicators? An analysis of the financial service and real sector confidence indexes: evidence from Turkey

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Article history[1]**.** Received 8 January 2020; first revision required 28 February 2020; accepted 7 April 2020.

Abstract. The primary aim of this study is to analyze the impact of financial services and real sector confidence indexes on some macroeconomic and financial indicators such as industrial production, inflation, stock market index, foreign exchange rates and interest rates in Turkey for the period from May 2012 to May 2019. In this study, the unit root properties of these series are tested by using the Narayan and Popp (2010) unit root test with two structural breaks and the Enders and Lee (2012) Fourier ADF unit root test with multiple structural breaks. We investigate the causal link between confidence indicators and macro-financial variables using the Fourier Toda Yamamoto causality test proposed by Nazlioglu et al. (2016). The results suggest a strong link between financial services and real sector confidence indexes on macro-financial indicators such as stock market index and inflation, supporting the evidence of the short-run impact of confidence indexes on these variables.

Keywords. confidence indicators, stock market index, inflation, structural breaks
JEL Codes. C10, E70, G40
DOI. https://doi.org/10.17979/ejge.2020.9.1.5948

1. Introduction

The Turkish economy, which launched a strong recovery period towards minimizing the adverse effects of 2000-01 Economic Crisis by ensuring fiscal and financial stability, has experienced a substantial growth period with the contribution of the positive global economic atmosphere in the post-crisis period. It is obvious that confidence in the real economy and financial system has played a major role in this development. Fiscal discipline, structural reforms aimed at achieving macroeconomic stability and tight monetary and fiscal policies have contributed to the significant increase in confidence and stability in the Turkish economy. Therefore, the fundamental indicators have shown a significant improvement in the post-crisis period. Especially in the five-year-period following the year of 2002, high economic growth rates, gradually decreasing inflation rates and improving fiscal balances have been recorded. The

[1] A summary of this study has been presented at the "y-BIS 2019 Conference: Recent Advances in Data Science and Business Analytics, September 25-28, 2019, Istanbul.

structural reforms implemented after the 2000-01 Economic Crisis have strengthened the public finances and banking sector considerably. Also, they helped the Turkish economy to suffer less from the recent fluctuations of the 2008-09 Global Financial Crisis and 2010-14 European Sovereign Debt Crisis, which have had globally adverse effects. However, this positive trend has reversed in the last few years, and macro-financial indicators have started to signal negatively. Given the importance of confidence for the real economy and financial markets, it is clear that the deterioration tendency of the confidence indicators adversely affects the macroeconomic and financial variables such as GDP growth, employment, foreign exchange rates and interest rates through production, spending and investment decisions of economic agents.

Simultaneous relationship between expectations and production-spending-investment decisions of economic agents seems not surprising from a theoretical point of view since good or bad expectations, in other words, optimism or pessimism might limit the expenditures of both households and businesses. According to behavioral finance, economic agents and investors do not behave rationally and decide by taking into consideration psychological factors like expectations about the future. Therefore, future economic performance might be influenced by consumer and business sentiment.

The importance of psychological factors as sentiments and expectations has been emphasized in the analyses by a wide range of economists such as Keynes (1936) focusing on consumer and investor sentiments, Katona (1951) stating the importance of psychological factors, Cass and Shell (1983), Akerlof and Shiller (2009) drawing attention to the government's role on manipulating animal spirits, Farmer (2013), Bacchetta and Van Wincoop (2013), De Grauwe and Ji (2016) and Acharya et al. (2017). They see the root of the macroeconomic fluctuations in strictly psychological waves of optimism-pessimism and sunspot-driven waves and assume that the actions following these waves produce changes in fundamentals making the initial boom or bust in confidence sentiments as expectations ultimately materialize. Another group of economists like Beaudry and Portier (2006), Barsky and Sims (2012), Blanchard et al. (2013) Beaudry and Portier (2014), furthermore, suppose that agents have access to a non-measurable source of incomplete information concerning future developments of the economy; a signal, which make them perform to meet the economy's future demand today. In this framework, the economy is subject to recurrent booms and occasional busts (Nowzohour and Stracca, 2017).

While forecasting high confidence brings with becoming optimistic about the future, low confidence expectations can lead to pessimism (Akerlof and Shiller, 2009). Typically, the consumers with low expectations for the future might slow down their spending, and the businesses which are pessimistic concerning the economic outlook might postpone or cancel their planned investments (Kuzmanović and Sanfey, 2012). Therefore, economic activity decreases, investment-production falls, and unemployment increases. Based upon the basic idea which suggests that the interaction between high uncertainty and non-smooth adjustment frictions might lead businesses to react prudently and also indicates that these businesses,

facing a more uncertain environment, might stop hiring and investment and present the “wait and see” behaviour that result in a drop in the economic activity, Bachman et al (2013) construct measures of time-varying uncertainty from business surveys and investigate their relationship with economic activity over the business cycle for both Germany and U.S. They find out that an unexpected change in the the survey-based measures of uncertainty has a relationship with a significant decrease in production and employment in both Germany and the U.S. Moreoever, Baumohl (2012) emphasizes that while the positive expectations of investors is mostly reflected as increases in stock markets, the adverse investor sentiment lead to a decreasing trend in the stock prices.

On the other hand, since confidence cannot be observed or measured directly, any evaluation of confidence must depend upon indicators which are partial, qualitative and subject to several interpretations in many cases. In this regard, confidence indices, consistent measures of confidence, are implemented based on surveys to measure how economic decision-makers respond to the economic developments and to express the relationship between expectations and macroeconomic or financial variables. Sentiment measures are acquired from surveys capturing assessments on past, current and expected economic developments. Although the empirical relationship between sentiment indicators and economic variables is sometimes not obviously established as a result of the subjective nature of the responses, sentiment indicators have the capability to reflect movements in economic variables purely, and they can lead shifts in these variables. Therefore, sentiment indicators are quite helpful for economic analysis and forecasting when they bring cyclical economic movements. Confidence indicators seem to provide a good picture of serious cyclical changes in output, and they might help detect significant acceleration or deceleration in output growth when great changes in confidence are observed (Santero and Westerlund, 1996).

Oral et al. (2005) indicate that there is an increasing concern in terms of the confidence indicators to follow the economic developments and to provide the researchers with the early signals of the turning points in the economic activity, these indicators are used by both the government and the private sector decision-makers in checking their performance and planning their actions. In this context, countries improved their indicator systems by using indexes from surveys. The surveys on expectations are mainly designed to indicate several changes in economic activity and commonly used in macroeconomic estimations and forecasts. The advantage of benefiting from survey results is that these results are available quickly before the related quantitative measures, including the same types of economic activity, are made public. Consequently, they are believed as complementary to the official statistics. The major objective of the surveys carried out in several ways is to help economic decision-makers get necessary information about the general tendency of the cyclical developments and future expectations as well. Confidence surveys can show changes to the economic outlook and turning points in the economic cycle.

According to the findings of surveys, confidence indexes as consumer, real sector and financial services confidence indexes are acquired. In this regard, having an idea about the

level of consumption, economic activity or financial services is highly important to interpret the current economic outlook. Data concerning real economic activity is announced with a large time lag. Therefore, timely data at higher frequencies become valuable to understand the current economic situation and anticipate future economic activity. This makes indicators with shorter publication lags quite popular for both policymakers and the public. In this context, the confidence indices, which are one of these timely indicators and released monthly, are cautiously followed by policymakers, analysts and forecasters, as well as media and their signals on private consumption and economic activity, are interpreted carefully. Since they are widely considered to be closely linked to current consumption-investment dynamics and also viewed as an instrument to forecast the future direction of these, it is well-established that confidence indices are sensitive to developments in financial markets and also affected by financial volatility (Karasoy, 2015; Karasoy and Yunculer, 2015).

In this study, our question is, whether the confidence indexes, which are simply linked with the sentiments and expectations, help us predict the changes in the macro-financial indicators or not. In this context, we focus on the impact of real sector confidence index and financial services confidence index on some macro-financial indicators. According to the definition made by OECD (2019), business confidence indicator, reflecting the expectations in the real sector, give us some information about future developments, based upon opinion surveys on developments in orders-stocks of finished goods and production in the industry sector. This indicator can be used to watch output growth and to predict turning points in economic activity. Numbers greater than 100 signal increased confidence in near future business performance and numbers less than 100 suppose pessimism towards future performance. The real sector confidence index is established to provide a key indicator of short-term business conditions for business managers and economic policymakers owing to the need of early warning indicators in order to anticipate financial and economic crises. The aim of the index is to forecast the expansion and contraction periods of economic activity. The real sector confidence index is a critical leading indicator in terms of the economic activity, and it signals to the business confidence based on the Business Tendency Survey. The financial services confidence index, which is used as a second explanatory variable in this study, is based on the answers given to the Financial Services Survey of the CBRT carried out with the institutions operating in the financial sector and which reflects the confidence to the financial services in the system (CBRT, 2019b: 4). The FSCI, with monitoring of past assessments and future prospects by executives of financial institutions including bank, insurance companies, factoring, leasing companies and so on, has become a key benchmark that reflects trends and developments in the financial industry. The objective of this study is to evaluate the empirical validity of the real sector and financial services confidence indexes in anticipating the evolution of economic activity by considering monthly data from 2012:05 to 2019:05. In answering whether the confidence indexes have an impact on economic activity, after testing the unit root properties of the series by using the Narayan and Popp (2012) and Enders and Lee (2012) Fourier ADF unit root tests, the causal relationship from the confidence indices to these variables are examined by

employing the Fourier Toda Yamamoto causality test proposed by Nazlioglu et al. (2016). When reviewed the academic literature, it is seen that there are very few studies that concentrate on emerging market economies. To our knowledge, this paper is the first to systematically analyze the relationships from financial services and real sector confidence indexes to macro-financial variables in Turkey by modelling the variables under the Fourier framework. In this way, we appropriately take into consideration multiple structural breaks without a need of the number, form or date of these breaks through the Fourier approach.

The study is organised as follows. In the following section, we give brief information pointing to the factors leading to deterioration in confidence indicators and the current economic situation in Turkey. After presenting the other studies focusing on confidence indicators, we try to analyze the causality relationship from the real sector and financial services indexes to the macro-financial indicators and report the estimation results acquired by employing Fourier Toda Yamamoto causality test. Finally, we conclude by summing up and giving some policy implications.

2. The Factors Leading to Deterioration in Confidence Indicators in Turkey

Turkey, in the aftermath of the 2000-01 Crisis, has shown a healthy macro-economic outlook with the succesful trend of indicators such as growth rate, inflation rate and unemployment rate. Confidence in the economy and financial markets has played a major role in this positive trend. However, in the last few years, this trend has reversed, and macroeconomic indicators have started to signal negatively. The Turkish economy has been badly affected in the last period, which covers the period of 2016-2018 particularly. Economic growth rate decreased to 1,6 percent in 2018:Q3, and a negative growth rate is expected in 2019 by economists. In parallel, consumer, real sector and financial services confidence showed a drop in 2018. In a report concerning emerging market economies including Turkey published in May 2019 by Moody's, a credit rating agency, weak or deteriorating macroeconomic environment and low economic growth have signaled to the instability of confidence (Moody's Report, May 2019). In the report, the inflation rate and the foreign exchange rates are expected to keep their high levels in the following year, too. In another report published by Fitch, global economic outlook report, it is emphasized that that low growth has been expected to be triggered by low confidence in 2019 (Fitch Global Economic Outlook, 2019). Table 1 includes information about the macro-financial indicators in the period of 2012-2018.

Table 1. Macro-financial Indicators: 2012-2018.

Indicators	2012	2013	2014	2015	2016	2017	2018Q3	2018Q4
Economic growth rate	2,2	8,5	5,2	6,1	3,2	7,4	1,6	-3,0
Inflation rate(CPI)	6,1	7,4	8,2	8,8	8,5	11,9	24,5	20,3
Unemployment rate	9,2	9,7	9,9	10,3	10,9	10,9	13,1	13,5
Current Account Deficit	-5,5	-6,7	-4,7	-3,7	-3,8	-5,6	-0,8	-1,7
USD/TRY (Average)	1,8	1,9	2,2	2,7	3,0	3,7	5,6	5,5
EUR/TRY (Average)	2,3	2,5	2,9	3,0	3,3	4,1	6,5	6,3
Benchmark Interest Rate	9,7	10,0	8,0	10,8	10,7	13,4	25,9	19,7
Industrial Production Index	91,6	100,9	108,5	116,9	117,5	129,9	114,7	117,2
BIST 100 Index	64,9	67,8	85,7	71,7	78,1	115,3	99,9	91,2

Source: TUSIAD(2019), TURKSTAT(2019), CBRT(2019a).

Figure 1 and 2 present the trends of FSCI and RSCI for the period from 2012:05 thorough 2019:05. As seen from the graphs, there has been a clear decline in RSCI and FSCI since the second half of 2018. Most notably, the confidence indicators have continued its moderate trend in 2017.There has been a significant decline in both financial services and real sector confidence indicators by the end of 2018. In December 2018, the FSCI rose to the lowest level, recorded as 118.10, since 2012:05. It is seen that it took its highest value, recorded as 187.30 in November 2014. When analyzed the values of RSCI, it is seen that it took its lowest value, 87.60, in 2018:10 and it took its highest value, 115.40, in 2012:05. In this period, it is clear that the expectations regarding the general economic situation have become more pessimistic in the second half of 2018.

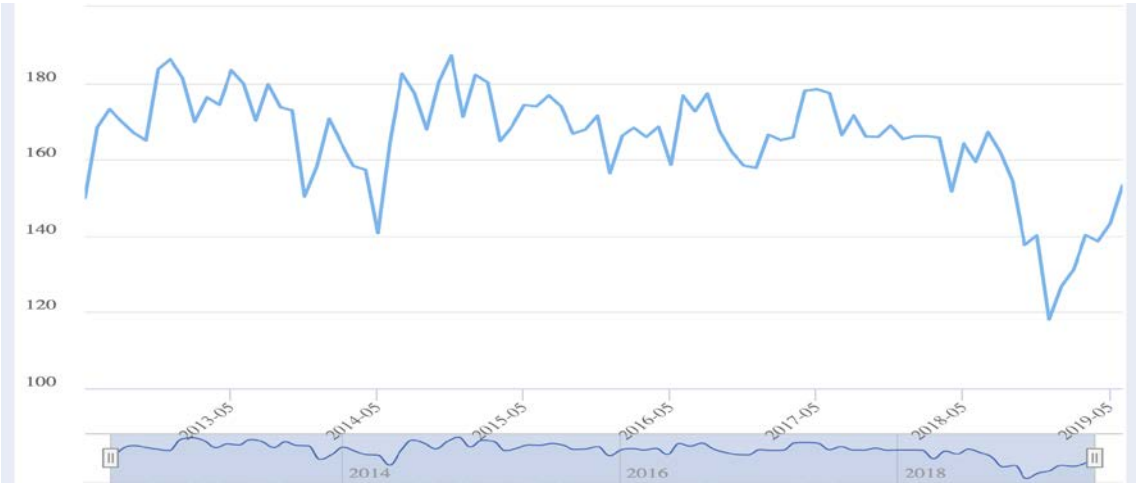

Figure 1. Financial Services Confidence Index: 2012:05-2019:05. Source*:* CBRT EVDS (2019a). Available at: https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket Access date: 15.06.2019.

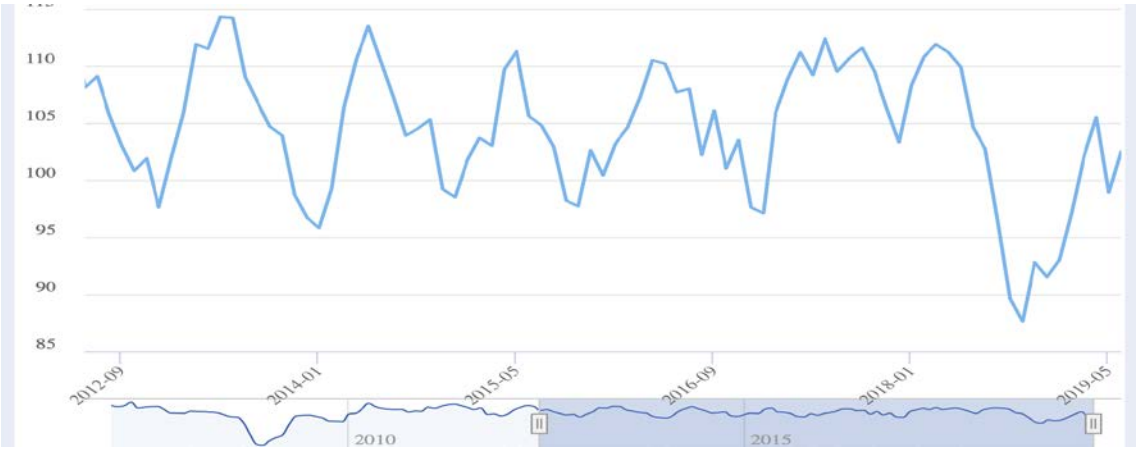

Figure 2. Real Sector Confidence Index: 2012:05-2019:05. Source: CBRT EVDS (2019a). Available at: https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket Access date: 15.06.2019.

The issue of confidence is of great importance for both the real economy and the financial markets. To analyse in more detail what has been driving deterioration in confidence indicators in the recent period, it is necessary to look at the developments in the economy. In Turkey, credit expansion in recent years, economic fragility has increased, the increase in the external debt and inflation made economic outlook of 2018 quite risky. In 2018, the capital outflows from emerging market economies, including Turkey and some adverse political country-specific uncertainties made Turkey confront a serious financial shock. The real economy continues to shrink due to this shock. The large external debt and the credit deposit rate rising to 150 percent have signaled that the economy needs a controlled slowdown. It is seen that foreign debt to GDP ratio and net foreign exchange position of the real sector to GDP ratio have reached 53 percent and 25 percent, respectively. The real sector has faced not only the exchange rate but also the interest rate shock. Cash shortage and access to financial sources have become the most important issues as a result of increasing uncertainty. Real sector confidence index has seen its lowest level since the 2008-09 Crisis. Compared to the last year, it is seen that since the USD/TRY and EURO/TRY rates as well as market interest rates increased significantly, the real economy remains under this heavy financing and debt burden. Given the fact that the inflation rate, which rose to 11,9 percent in 2017, was recorded as 20,30 percent as of 2018, the expectations worsen mainly due to the increases in the cost of imported goods. The contraction in the economy led to a rise in the unemployment rate, which was recorded as 12 percent, as well (TUSIAD, 2019).

3. Literature Review

Expectations and uncertainty about future economic and financial outlook, which are of key importance particularly according to the behavioral finance theory, are measured through confidence indexes such as consumer confidence index, real sector confidence index and financial services confidence index, which are regularly followed by central banks, governments and other private institutions. Therefore, in the academic literature, the number of studies has

been increasing on their use in monitoring the current economic situation and predicting economic developments. On the other hand, it is seen that most of these studies focus on consumer confidence indices and some of these deal with business confidence. For instance, Santero and Westerlund (1996) find in their study, in which they analyze the relationship between confidence indicators based on consumer and business surveys of several OECD countries, that there is a statistically significant relationship between business confidence and gross domestic product, industrial production and real business investment.

Similarly, after testing the rationality of consumer expectations and assessing their usefulness in forecasting expenditure by using the household data of the Michigan Survey, Souleles (2001), indicate that consumer is useful in predicting future consumption, even checking for lagged consumption and a group of macro-variables like stock prices. In the study carried out by Jansen and Nahuis (2003), which focus on the short-run relationship between the consumer confidence and stock market developments in a group of European countries in the period of 1986-2001, is found a positive correlation between the changes in consumer sentiment and stock returns for nine countries, except Germany. In another study using vector autoregressions which include variables representing consumer confidence, Utaka (2003) examines the impact of consumer confidence on the economic activity in Japan empirically. Based on confidence and GDP monthly, quarterly and semiannually data in the period of 1982-2000, it is found that consumer confidence does have a positive and significant effect on GDP fluctuations in the case of monthly and quarterly data, while it does have no impact on GDP in the case of semiannual data implying that consumer confidence has an effect on economic fluctuations in short-run. Furthermore, Ludvigson (2004), reviewing The University of Michigan's Consumer Sentiment Index and the Conference Board's Consumer Confidence Index, which are the most widely followed measures of U.S. consumer confidence, focus on the relationship between consumer confidence and consumer spending. He concludes that such measures of consumer attitudes have a significant forecasting power. Accordingly, measures of consumer attitudes appear to be directly related to future consumption growth, and confidence surveys can predict future changes in labor earnings and non-stock market wealth. Vuchelen (2004), proposing a direct measure of expected economic conditions and uncertainty, test the average growth rate and the dispersion of forecasts in regression analyses for the consumer sentiment in Belgium for the period of 1985-2000 by using quarterly data. In contrast with the findings of Utaka (2003), his results suggest that a decrease in consumer confidence imply a decrease in the growth rate in Belgium by using quarterly data for the period of 1985-2000.

In another study, focusing on the relationship between confidence and economic fluctuations, Afshar et al. (2007), investigate the link between three confidence measures belonged to businesses, consumers, investors and economic fluctuations by using quarterly data for the U.S. in the period from 1980 to 2005. Their findings support the evidence of a causality relationship from confidence measures to GDP. Moreover, forecast variance decompositions of GDP suggest that consumer confidence, stock return, and purchasing manger's index, account for large variations in GDP, meaning that these three measures play

important roles in the economic fluctuations. In his study focusing on the relationship between the industrial confidence indicator and industrial production index for France, Germany, Italy and Romania, Gagea (2012) finds evidence supporting the relationship between the confidence index and industrial production index, even the relationship between the variables for Germany and Romania seems quite weak. Van Aarle and Kappler (2012) evaluate the potential impact of economic sentiment in business cycle fluctuations by integrating the European Commission Economic Sentiment Indicator (ESI) data into an empirical analysis of the Euro-Area business cycle. In this context, after examining the role of changes in Economic Sentiment Indicator (ESI) on unemployment, output and retail sales over the period of 1990-2011, they suggest that sentiment shocks have an impact on these macroeconomic variables. They also find out that economic sentiment is affected by economic conditions and shocks as well. In the same way as Utaka (2003), Utaka (2014) empirically test the effect of consumer confidence on changes in GDP for Japanese economy bu using the quarterly data and adopted vector autoregression framework. In addition to Utaka (2003), after dividing the total estimation period into two parts as pre-and post-bubble periods, analyze the transition of that effect through the ages by comparing their effects in each period. It is found that although consumer confidence does have a significant effect on GDP, this effect becomes greater in a post-bubble period than in a pre-bubble period. Nowzohour and Stracca (2017), focusing on the role of sentiment in the business cycle, review six existing measures of sentiment such as consumer confidence, economic policy uncertainty and stock market volatility. They use monthly panel data for 27 countries, including consumer and business confidence indexes in the period of 1985:01-2016:10. Their results indicate that different measures are surprisingly low correlated on average in each country while these measures are highly positively correlated across countries, signaling to the existence of a global impact. They emphasize, of these sentiments, consumer confidence has the closest co-movement with economic and financial variables, implying that economic sentiment is a real driver of activity.

Unfortunately, it is seen there are a few studies focusing on the relationship between confidence indicators and some macroeconomic variables or financial indicators in Turkey. Oral (2005), Kandir (2006), Ozsagir (2007), Celik and Ozerkek (2009), Aktas and Akdag (2013), Arisoy (2012) and Iskenderoglu and Akdag (2017) empirically analyze the relationship between measures of confidence and macro-financial variables. Of these, Ozsagir (2007) in his study, after testing the relationship between real sector confidence index and economic growth rates for the period of 1988-2005, indicates that there is a significant positive relationship between RSCI and economic growth rate, meaning that the confidence atmosphere does have a positive impact on economic growth. Çelik and Özerkek (2009) investigate the relationship between consumer confidence and some macroeconomic and financial variables such as personal consumption, stock market index, real exchange rates and interest rates not for Turkey but for 9 European Union countries. Using panel data analysis in the period of 1997-2006, they detect the existence of a long-run relationship between consumer confidence and the relevant variables, particularly signaling that consumers have the capability to detect the early signals

about future economic growth as they contribute via the channel of consumption. Arisoy (2012) analyzing the effect of the confidence indices on consumption spending, employment and stock market indices in the period of 2005:01-2012:01, conclude that real sector confidence index do have impact on both the stock market indices and industrial production index while consumer confidence index do have impact on consumer spending. Directly focusing on the financial services confidence index, Iskenderoglu and Akdag (2017), examine the existence of a relationship between financial services confidence index announced by CBRT and the other variables as the stock market index (BIST100) and CBRT net funding in the period beginning from 2015:05 to 2017:08. Their findings support the evidence of the causality relationship from FSCI to both BIST100 index and CBRT net funding.

4. Empirical Analysis

In this section, we study whether confidence indicators provide information about the macro-financial outlook. Following testing the stationary properties of variables with the help of Narayan and Popp (2012) and Enders and Lee (2012) Fourier ADF unit root tests, we then proceed to test if there is a causality relationship from the confidence indicators to each of the series by using the Fourier Toda Yamamoto causality test proposed by Nazlioglu et al. (2016). According to the findings, if the asymptotic p-values are below 0.05 as stated in the study of Nazlioglu et al. (2016), we, therefore, can identify a causality relationship between the variables which signals that confidence indicators provide us information about the macro-financial outlook. It is emphasized that when Fourier functions are used in the analysis, multiple structural breaks are taken into consideration, and the findings can significantly change.

4.1. Data

Confidence based on expectations is one of the key factors determining agents' decisions. In analyzing the impact of confidence indicators on some macroeconomic fundamentals such as industrial production index and inflation rate and some domestic volatility indicators of financial variables such as foreign exchange rates, interest rates and stock market index, we use monthly data belonged to the financial services confidence index and the real sector confidence index. In Turkey, real sector and financial services confidence surveys have been carried out regularly by the Central Bank of the Republic of Turkey since 2007:05 and 2012:05, respectively. The surveys are carried out monthly via face-to-face interviews with 1.000 individuals that are chosen through stratified random sampling. Economic activity, income, age, education and gender are the criteria which are taken into consideration in forming the strata. In this study, our data set covers the period 2012:05-2019:05. Although our sample seems smaller than the samples of the studies which cover other developed economies like the U.S. and some Euro-Area countries including Germany, U.K and France, our data set includes the available data because we have no confidence data belonged to financial services for Turkey before 2012. Despite this limitation, our data set seems sufficient to carry out our analysis.

Table 2. List of Variables.

Independent Variables	**Measure**	**Abbreviation**	
Confidence Indicator 1	Financial Services Confidence Index	FSCI	
Confidence Indicator 2	Real Sector Confidence Index	RSCI	
Dependent Variables	**Measure**	**Abbreviation**	**Expected Relationship**
Production	Industrial Production Index	PMI	(+)
Inflation rate	Consumer Inflation Index	CPI	(+)
Foreign Exchange Rate	USD/TRY (average)	USD	(+)
Foreign Exchange Rate	EUR/TRY (average)	EUR	(+)
Stock Market Index	BIST100 (average)	BIST	(+)
Interest Rates	Interbank O/N Rate (average)	O/N	(+)

Variables appear in monthly in our analysis and in Log and Delta (first difference) in our regressions.

As seen at Table 2, in our analysis, we employ real sector and financial services confidence indexes as the independent variables while industrial production index, consumer inflation index, stock market index, interest rates and foreign exchange rates as dependent variables.

4.2. Stationarity and Causality

In order to evaluate the impact of the confidence indicators, at first, we try to get adequate information on the stationarity properties of the variables being used in the analysis by employing Narayan and Popp (2010) as well as Enders and Lee (2012) Fourier ADF unit root tests. Both tests are based on the augmented Dickey-Fuller type test. In this context, Narayan and Popp (2010) develop an augmented Dickey-Fuller-type test for unit roots which allows for two structural breaks while Enders and Lee (2012) propose a new unit-root test by using Fourier function in the deterministic term in a Dickey-Fuller type regression framework that can complement the Fourier LM and DF-GLS unit root tests and accounts for multiple structural breaks. It is seen that both these tests do have good size and power properties. Furthermore, in the Fourier ADF (2012) unit root test, contrary to many other methods, it is not essential to know the number, form or date of the structural changes.

Narayan and Popp (2010) think two different specifications by allowing for two breaks in the level of a trending data series and two breaks in the level and slope of a trending data series. In the model, the date of breaks is considered to be unknown. The DGP of a time series y_t, which they present, does have two components; (d_t), deterministic component and (u_t) stochastic component, as follows:

$$y_t = d_t + u_t, \quad (1)$$

$$u_t = \rho u_{t-1} + \varepsilon_t, \quad (2)$$

$$\varepsilon_t = \psi^*(L)e_t = A^*(L)^{-1}B(L)e_t, \quad (3)$$

with $e_t \sim iid(0, \sigma_e^2)$. $A^*(L)$ and B(L), the roots of the lag polynomials, which are of order p and q, are assumed to lie outside the unit of circle.

Of two different specifications which they consider both for trending data, Model 1 (M1) (level) allows for two breaks in level and the Model 2 (M2) allows for two breaks in level as well as slope. The specifications of both models differ in how the deterministic component, d_t , is defined as follows:

$$d_t^{M1} = \alpha + \beta t + \psi^*(L)(\theta_1 DU_{1,t}^{|} + \theta_2 DU_{2,t}^{|}), \quad (4)$$

$$d_t^{M2} = \alpha + \beta t + \psi^*(L)(\theta_1 DU_{1,t}^{|} + \theta_2 DU_{2,t}^{|} + \gamma_1 DT_{1,t}^{|} + \gamma_2 DT_{2,t}^{|}), \quad (5)$$

$$DU_{1,t}^{|} = 1(t > T_{B,i}^{|}),\ DT_{1,t}^{|} = 1(t > T_{B,i}^{|})(t - T_{B,i}^{|}), \quad \text{i=1,2} \quad (6)$$

Here, the true break dates are denoted by $T_{B,i}^{|}, i = 1,2,$. θ_1 and γ_i, the parameters, show the magnitude of the level and slope breaks, respectively. The inclusion of $\psi^*(L)$ in Equations (4) and (5) make breaks occur slowly over time. This process, which is known as the IO model, is used. Accordingly, the IO-type test regressions to test for the unit root hypothesis for M1 and M2 could be derived by merging the structural model (1)-(5). The test equations for M1 and M2 do have the following forms, respectively:

$$y_t^{M1} = \rho y_{t-1} + \alpha_1 + \beta^* t + \theta_1 D(T_B^{|})_{1,t} + \theta_2 D(T_B^{|})_{2,t} + \\ + \delta_1 DU_{1,t-1}^{|} + \delta_2 DU_{2,t-1}^{|} + \sum_{j=1}^{k} B_j \Delta y_{t-j} + e_t \quad (7)$$

with $\alpha_1 = \psi^*(1)^{-1}[(1-\rho)\alpha + \rho\beta] + \psi^{*|}(1)^{-1}(1-\rho)\beta$, the mean lag being $\psi^{*|}(1)^{-1}$, $\beta^* = \psi^*(1)^{-1}(1-\rho)\beta$, $\phi = \rho - 1$, $\delta_i = -\phi\theta_1$ and $D(T_B^{|})_{1,t} = 1(t = T_{B,i}^{|} + 1)$, i=1,2.

$$y_t^{M2} = \rho y_{t-1} + \alpha^* + \beta^* t + \kappa_1 D(T_B^{|})_{1,t} + \kappa_2 D(T_B^{|})_{2,t} + \\ + \delta_1^* DU_{1,t-1}^{|} + \delta_2^* DU_{2,t-1}^{|} + \gamma_1^* DUT_{1,t-1}^{|} + \gamma_2^* DUT_{2,t-1}^{|} + \sum_{j=1}^{k} B_j \Delta y_{t-j} + e_t, \quad (8)$$

where $\kappa_i = (\theta_i + \gamma_i)$, $\delta_i^* = (\gamma_i - \phi\theta_i)$ and $\gamma_i^* = -\phi\gamma_i)$, i=1,2.

We use the t-statistics of $\hat{\rho}$, denoted $t_{\hat{\rho}}$, in Equations (7) and (8), to test the unit root null hypothesis of $\rho = 1$ against the alternative hypothesis of $\rho < 1$. Here, $DU_{i,t}^{|}$ and $DT_{i,t}^{|}$, the dummy variables are lagged in Equations (7) and (8).

Table 3. Narayan and Popp (2010) ADF unit root test results with two structural breaks.

	Break in level(M1)			Break in level and trend(M2)		
	Test statistic	**TB1**	**TB2**	**Test statistic**	**TB1**	**TB2**
FSCI	-6,004	2014:04	2016:04	-6,614	2014:04	2017:02
RSCI	-5,701	2016:12	2018:02	-8,485	2015:04	2017:11
PMI	-8,548	2013:07	2016:08	-8,586	2014:11	2015:11
CPI	-2,973	2016:10	2018:02	-6,891	2016:06	2017:12
USD	-5,177	2014:02	2018:02	-6,430	2014:12	2017:10
EUR	-4,648	2014:07	2018:02	-5,318	2016:04	2018:02
LBIST	-4,487	2014:02	2016:11	-4,621	2016:03	2018:02
O/N	-5,509	2016:05	2018:02	-6,836	2013:10	2017:08

Notes: Critical values for M1 = -4.922, -4.191, -3.823 at 1%, 5%, 10%, respectively. Critical values for M2 = -5.380, -4.631, -4.251 at 1%, 5%, 10%, respectively. TB1 and TB2 are the dates of the structural breaks. The test based on 5000 replications.

Table 3 presents the findings of the Narayan and Popp (2010) unit root test. It is seen that in all cases, the test rejects the unit root null for M1 and M2 except CPI series for which the test can not reject the unit root for M1 while it also becomes stationary for M2, implying that all series are stationary under two structural breaks. The break dates are closely related to the critical period 2014-2018 in which the political risk increased significantly, and the confidence indicators demonstrated a deteriorating trend in Turkey.

After checking the stationary properties of series by using Narayan and Popp (2010) unit root test which allows for two structural breaks, we then proceed by employing Enders and Lee (2012) Fourier ADF unit root test. Enders and Lee (2012) consider the following Dickey-Fuller test in which the deterministic term is a time-dependent function specified by α(t):

$$\mathrm{yt} = \alpha(\mathrm{t}) + \rho \mathrm{yt} - 1 + \gamma \mathrm{t} + \varepsilon \mathrm{t}\,, \tag{9}$$

where ε_t is a stationary disturbance with variance σ_ε^2 and α(t) is a deterministic function of t. Enders and Lee (2012) try to test the null hypothesis of a unit root (i.e., ρ = 1). Any test for ρ = 1 is problematic if α(t) is misspecified, when the form of α(t) is unknown. As an approximation of the unknown functional form of α(t), they consider the Fourier expansion:

$$\alpha(\mathrm{t}) = \alpha_0 + \sum_{k=1}^{n} \left(\alpha_k \sin\frac{2\pi kt}{T} + \beta_k \cos\frac{2\pi kt}{T}\right); \qquad \mathrm{n} \le \mathrm{T}/2, \tag{10}$$

where n symbolizes the number of frequencies included in the approximation, k stands for a particular frequency, and T denotes the number of observations.

Obviously, the process is linear and the conventional non-stationary testing methodologies are appropriate, if $\alpha_1 = \beta_1 = \cdots = \alpha_n = \beta_n = 0$. On the other hand, at least one Fourier frequency must be present in the data-generating process, if there is a break or nonlinear trend. Since it is not possible to use a large value of n in a regression framework and the use of many frequency components can lead to an overfitting problem, Enders and Lee (2012) try to choose the proper frequencies to include in Equation (10), instead of positing the specific form of α(t). Supposing

that they use only a single frequency k and consider the testing regression as follows:

$$\Delta y_t = \rho y_{t-1} + c_1 + c_2 t + c_3 \sin(2\pi kt/T) + c_4 \cos(2\pi kt/T) + e_t \quad (11)$$

Let τ_{DF_t} the t -statistic for the null hypothesis ρ = 0 in Equation (11). The asymptotic characteristics of the DF version tests do not differ from those of the LM version of the test and they decide not to present the asymptotic distribution. The important point is that the critical values for the null hypothesis of a unit root will rely solely on the frequency (k) and the sample size (T) just like in the other version tests. Nevertheless, they do not rely on the coefficients of the Fourier terms or other deterministic terms. Thus, Ender and Jones (2012) can systematize critical values benefiting from simulations. Critical values of τ_{DF_t} are shown in Table 1(a) in their study. If the researcher wants to specify the value of k, the test could be carried out directly benefiting from these critical values. If the value of k is approximated, the test for a break could be implemented as follows:

At the first step: they estimate Equation (11) for all integer values of k such that 1 ≤ k ≤ 5. It is seen that the regression with the smallest sum of squared residuals (SSR) yields $\hat{k}$. If the residuals show serial correlation, augment (11) with lagged values of Δy_t .

At the second step: they indicate that pretesting for nonlinearities could be conducted. For this purpose, they use the usual F-test for the null hypothesis: $c_3 = c_4 = 0$. When the unit-root null is imposed on the data-generating process (DGP), the distribution of the F-statistic is non-standard. Thus, they can use the critical values of $F(\hat{k})$ shown in Table 1(a) which was stated in their study. Accordingly, if the sample value of F is less than the critical value, the null hypothesis of a linear trend cannot be rejected. Under this circumstance, they suggest performing the usual linear Augmented Dickey-Fuller test.

Table 4. ADF and Fourier ADF Unit root Test Results (T=85).

Variables	Frequency	MinSSR	Fourier ADF Test-Statistic	ADF Test-Statistic	Fourier ADF F-Statistic
FSCI	3	5895.048	-3.87	-3.23	3.24
RSCI	2	954.5519	-3.55	-3.54	1.61
PMI	1	5905.716	-6.24	-1.82	9.42
INF	5	790.0850	3.82	3.05	3.01
DIFINF	1	773.5279	-6.72	-2.86	2.55
LOGBIST	1	0.250497	-3.91	-2.72	3.77
EUR	5	3.235448	1.33	1.18	1.92
DIFEUR	5	2.979959	-6.39	-8.25	1.01
USD	5	2.384208	1.62	1.21	2.47
DIFUSD	5	2.129045	-5.94	-4.24	1.10
INTRATE	5	140.5274	-0.06	-0.16	2.59
DIFINTRATE	5	115.8366	-5.52	-5.90	1.24

Notes: k denotes the optimal frequency value with the smallest sum of squared residuals (SSR). Critical values for Fourier ADF unit root test for k=1 and T=85; -4,42, -3,81, -3,49, k=2 and T=85; -3,97, -3,27, -2,91, k=3 and T=85; -3,77, -3,07, -2,71, k=5 and T=85; -3,58, -2,93, -2,60 at 1%, 5% and 10%, respectively. Critical values for Fourier ADF F Statistics for T=85; 10,35, 7,58, 6,35 at 1%, 5% and 10%, respectively. Because we employ the model used without a linear trend, we take into consideration the critical values shown in Table 1(b) in the study of Enders and Lee (2012). Critical values for ADF unit root test are -3,51, -2,89 and -2,58 at 1%, 5% and 10%, respectively.

As seen in Table 4, FSCI and RSCI series seem stationary because the t-statistics are greater than the critical values stated in the study of Enders and Lee (2012). On the other hand, F-test results which are used to test the significance of the trigonometric terms, do not confirm that these series are stationary because it is seen that trigonometric terms for these variables are not significant when checked the F-statistics with those shown in the same study. So after employing the standard ADF unit root test, we can confirm that FSCI and RSCI series are stationary. The PMI series is stationary because both the Fourier ADF t-statistics and F-statistics are significant while the LOGBIST series is stationary after checking both Fourier ADF and standard ADF t-statistics because trigonometric terms are not significant. As to the INF, EUR, USD and INTRATE series, it is seen that the variables have unit-root at its level, they become stationary after their first difference. According to the F-Test results which are used to test the significance of the trigonometric terms, it seems that trigonometric terms for these variables are not significant, the ADF test-statistic values again are taken into consideration, and it is seen that they all become stationary after their first difference.

In the second stage, we employ Fourier Toda Yamamoto Causality Test proposed by Nazlioglu et al. (2016) in order to investigate the causal linkages from FSCI and RSCI to the macro-financial indicators. Since the linkages between the variables have been exposed to gradual shifts, and linear specifications are generally improper to capture the relationships, econometric examinations are not usually direct and simple. As a result, traditional procedures which look for sudden shifts become insufficient in capturing gradually emerging structural changes. Nazlioglu et al. (2016) modify the Toda-Yamamoto (1995) Granger Causality approach by implanting a Fourier approximation to be able to explain gradual or smooth structural shifts. There is no need for a prior knowledge concerning the number, dates and form of breaks when used the Fourier approximation. Their study based on the analysis proposed by Ender and Jones (2016) in which a Fourier approximation is employed by using a limited number of low-frequency components in an effort to clarify the determination of the form of breaks and estimation of the number and dates of shifts in a VAR framework.

The causality approach which Nazlioglu et al. (2016) utilize to examine the causal relationship between oil prices and Real Estate Investment Trusts (REITs) in their study is based on considering a VAR*(p + d)* model in which p denotes lag length and d shows the maximum integration degree of the variables. The VAR*(p+ d)* model can be written as:

$$y_t = \alpha + \beta_1 y_{t-1} + \cdots + \beta_{p+d} y_{t-(p+d)} + \epsilon_t \tag{12}$$

where y_t consists of K endogenous variables, α is a vector of intercept terms, β are coefficient matrices and ϵt are white noise residuals. The null hypothesis of Granger non-causality is based on zero restriction on first *p* parameters (H_0:β_1=…=β_p=0) of the *Kth* element of y_t. Wald statistic for this hypothesis does have an asymptotic χ^2 distribution with *p* degrees of freedom. Here, y_t in Equation (12) is presumed not to have any structural break by the presumption that the

intercept terms α are constant over a period of time.

In a VAR specification, since a break in one variable might cause shifts in the other variables, managing structural breaks and specifying the original source of breaks become hard. The standard Granger causality test has a plausible size and power attributes if the shifts are sharp and the test functions much better if the shifts are gradual. It is also sensitive to the unit root and co-integration characteristics of the VAR model and makes testing unit root and co-integration for causal inferences necessary because Wald test does have a non-standard distribution when the variables in VAR model are integrated or co-integrated, and it also depends on nuisance parameters. By solving such problems, the Toda-Yamamoto approach seems strong to unit root and co-integration characteristics of the VAR system. By expanding the Toda–Yamamoto framework with gradual structural breaks by embedding a Fourier approximation, Nazlioglu et al. (2016) introduce a new and simple methodology to capture breaks in Granger causality analysis. In order to take into account the structural shifts, they ease the assumption of the intercept terms *α* being constant over time and modify the VAR model in Equation (12) as:

$$y_t = \alpha(t) + \beta_1 y_{t-1} + \cdots + \beta_{p+d} y_{t-(p+d)} + \epsilon_t \tag{13}$$

where the intercept terms *α(t)* imply the functions of time and indicate any structural shifts in y_t. To be able to capture structural shifts as a gradual process with an unknown date, number and form of breaks, the Fourier expansion is specified by

$$\alpha(t) = \alpha_0 + \sum_{k=1}^{n} \gamma_{1k} \sin\left(\frac{2\pi kt}{T}\right) + \sum_{k=1}^{n} \gamma_{2k} \cos\left(\frac{2\pi kt}{T}\right), \tag{14}$$

where n shows the number of frequencies, γ_{1k} and γ_{2k} mensurate the amplitude and displacement of the frequency, respectively. By the way, a large value of n is most likely to be connected with a stochastic parameter variation, leading to a decrease in freedom and creating an over-fitting problem. As stated by Becker et al. (2006), a single Fourier frequency produces a variety of shifts in deterministic components without taking into account date, number, and form of breaks. Hence, Nazlioglu et al. (2016) use a single frequency component and define *α(t)* as:

$$\alpha(t) = \alpha_0 + \gamma_1 \sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 \cos\left(\frac{2\pi kt}{T}\right) \tag{15}$$

where k indicates the frequency for the approximation. By replacing Equation (15) in Equation (13), they acquire the equation as:

$$y_t = \alpha_0 + \gamma_1 \sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 \cos\left(\frac{2\pi kt}{T}\right) + \beta_1 y_{t-1} + \cdots + \beta_{p+d} y_{t-(p+d)} + \epsilon_t \tag{16}$$

In this identification, examining the null hypothesis of Granger non-causality is the same as it is in Equation (12), and the hypothesis could be tested by using the Wald statistic. When the Fourier terms are used to check for breaks, the causality results vary from those documented before in several ways, and stronger relations, as well as richer sets of interactions between the variables, are found.

Table 5. Fourier Toda Yamamato Causality Test Results.

Relationship	Frequency	Wald-Stat	Asymptotic* p-value	Bootstrap p-value
FSCI→ BIST	2	17.122	0.017**	0.017
FSCI→ INTRATE	3	2.194	0.334	0.336
FSCI→ USD	3	0.911	0.823	0.828
FSCI→ EUR	3	2.070	0.558	0.563
RSCI→ PMI	1	0.338	0.561	0.575
RSCI→ INF	1	36.676	0.000***	0.003
RSCI→ INTRATE	1	11.609	0.312	0.340

Notes: → denotes to causality. Optimal k (frequency) and p (lag) are determined by Akaike information criterion. Bootstrap p-values are based on 1000 replications. ***, **, and * denote %1, %5, and %10 levels of statistical significance, respectively. Because n>50 in this study, we will take asymptotic p-value in comparison.

Table 5 shows the results of Fourier Toda-Yamamoto Causality Test. According to the results, when checked the asymptotic p-value regarding the variables, there seem to be causality relationships both from FSCI to BIST and RSCI to INF. It means that both the changes FSCI and RSCI have impacts on BIST and INF, respectively. On the other hand, we could not find any causality from FSCI to INTRATE, USD and EUR or from RSCI to PMI, INF and INTRATE. The findings supporting the impact of FSCI on BIST and the impact of RSCI on INF, signal that confidence indicators are associated with changes in macro-financial indicators such as inflation and stock market index.

5. Conclusions and policy implications

After the economic crisis of 2000-01, Turkey launched a process of a strong recovery in the financial system, particularly in the banking sector. Confidence has played a key role in the recovery of the macro-financial outlook of Turkey during the post-crisis period. In spite of the financial fluctuations in U.S. and Euro-Area in recent years, the sound financial system has been the main cause of the good economic performance of Turkey. Parallel to this, the real sector has recorded a good performance as a result of positive expectations concerning the Turkish economy and financial system until the last few-year-period in which there has been felt deterioration in confidence indicators. This study aims to examine the impact of confidence indicators on explaining some macro-financial variables, in other words, to assess the usefulness of FSCI and RSCI in forecasting economic and financial indicators in Turkey.

In this context, analyzing the causality relationship from confidence indicators on some macroeconomic and financial variables in Turkey for the period of 2012:05-2019:05, we look for the answer of this question: do real sector and financial services confidence indexes have

impact on industrial production index, inflation rate, stock market index, interest rates and foreign exchange rates. In answering this question, after testing the unit root properties of the series by using Narayan and Popp (2012) and Enders and Lee (2012) Fourier ADF unit root tests, the causality relationships from the confidence indexes to these variables are investigated by employing Fourier Toda Yamamoto causality test proposed by Nazlioglu et al. (2016). The results support the impact of confidence indexes on macro-financial indicators as the stock market index and inflation, indicating that confidence indexes have explanatory power on the macro-financial outlook of Turkey in the period of 2012:05-2019:05. Our findings are in line confidence with most of the studies in the literature, which indicate that the confidence indexes do have impacts on macro-financial outlook. Therefore, it could be said that FSCI and RSCI can be used to predict some of the macro-financial indicators like stock market index and inflation rate in Turkey.

As the literature on the impact of FSCI and RSCI on indicators like stock market index, interest rates and foreign exchange rates in Turkey is quite limited, our study is expected to be quite useful. It is seen that the studies dealing with this issue is not enough because of the data limitation, but as more data belonged to these variables, the opportunities for comprehensive analyses could increase in the future. To emphasize, there is a strong relationship betwen financial stability and confidence in an economy. In the countries including Turkey, which implement floating exchange rate regimes, capital inflows accelerate with the increasing confidence to the country and policies carried out, supporting economic growth. In case the fiscal discipline is ignored, and also the growth is based on external borrowing and imports, a deterioration in confidence indicators will lead to sudden capital outflows and severe fluctuations in exchange rates, causing uncertainty increase in both the real economy and financial markets. As a result of decreasing confidence, capital outflows will accelerate even more, making the financial vulnerability increase to a great extent. In this regard, to achieve and maintain financial stability is of great importance since it is a sign of sustainable confidence in both the real economy and the financial system.

As emphasized in a monthly bulletin of European Central Bank (January 2013), confidence indicators gain importance and predictive power during the period of financial stress. Accordingly, the link between confidence indicators and economic performance is not straightforward. In the normal periods, changes in confidence might reflect misperceptions regarding economic activity or basically be following real developments. Therefore, confidence indices might have weak leading properties. Nevertheless, a significant deterioration in confidence indices helps us predict future economic developments since confidence indices reflect critical changes in economic agents' behaviour in such circumstances. Given the fact that the tension increases gradually in Turkey recently, it is obvious that the number of studies will rise in the future. Overall, this study, in which we try to analyze whether confidence indicators have impacts on macroeconomic and financial performance in Turkey, partly confirms the usefulness of FSCI and RSCI to forecast changes in macro-financial indicators like inflation and stock market index. In future studies, more detailed analyses could be carried out to reveal the

level of these impacts by employing other recent empirical approaches. Furthermore, by using a wide range of data and increasing the macroeconomic or financial variables, the scope of the studies could be expanded.

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