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*Araştırma Makalesi* ● *Research Article*

# A Hidden Relation Between Public Debt and Confidence

*Kamu Borcu ve Güven Arasındaki Saklı İlişki*

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| MAKALE BİLGİSİ | ÖZ |
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| *Makale Geçmişi:* <br> Başvuru tarihi: 10 Mart 2021 <br> Düzeltme tarihi: 30 Mart 2021 <br> Kabul tarihi: 5 Nisan 2021 <br><br> Anahtar Kelimeler: <br> Kamu Borcu <br> Reel Sektör Güveni <br> Tüketici Güveni <br> Saklı Eşbütünleşme | Bu çalışmada kamu ekonomisi açısından önemli bir gösterge olan kamu borç stoku ile güven arasındaki ilişkinin varlığı, kamu borç stokunun 2006 yılından sonra yükseliş eğilimi gösterdiği Türkiye özelinde test edilmesi amaçlanmıştır. Tüketici güven endeksi ve reel kesim güven endeksi ile kamu borç stoku arasındaki doğrusal olan ve olmayan nedensellik ilişkisinin varlığı saklı eşbütünleşme modelleri kapsamında incelenmiştir. Kamu borç stokunun birikimli negatif şokları ile reel sektör güven endeksinin birikimli pozitif şokları birlikte hareket etmektedir. Benzer şekilde kamu borç stokunun birikimli negatif şokları ile tüketici güven endeksinin birikimli pozitif şoklarının birlikte hareket ettiği gözlenmiştir. |

| ARTICLE INFO | ABSTRACT |
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| *Article history:* <br> Received: March 10, 20211 <br> Received in revised form: March 30, 2021 <br> Accepted: April 5, 2021 <br><br> Keywords: <br> Public Debt <br> Real Sector Confidence <br> Consumer Confidence <br> Hidden Cointegration | In this study, the relationship between the presence of these works in the public economy, an important indicator in terms of public debt with confidence, is intended to be tested specific to Turkey where public debt stock was in an upward trend after 2006. The existence of a linear and non-linear relationship between consumer confidence index and real sector confidence index and public debt stock was examined within the scope of the implicit cointegration. The cumulative negative shocks of the public debt stock and the cumulative positive shocks of the real sector confidence index act together. Similarly, it was observed that the cumulative negative shocks of the public debt stock and the cumulative positive shocks of the consumer confidence index moved together |

## 1. Introduction

While the three main economic agents in the economy, households, firms and the state make interrelated decisions, they are mutually affected by these decisions. The future expectations of these economic agents have an effect on economic decisions such as production, consumption, investment and savings. Expectations that are influenced by and affect different macroeconomic variables are basically discussed with adaptive expectations and rational expectations theories in the economic literature. Another factor that has an impact on macroeconomic variables in relation to expectations is confidence. According to Fukuyama (2001), confidence can be considered as a social capital and an increase in confidence level can positively affect macroeconomic factors (such as investment, demand, unemployment level). In addition, confidence, income growth, as well as the ability to predict changes in welfare, inflation, unemployment and real interest rates are far above

other macroeconomic variables (Acemoglu and Scott, 1994).

In this context, the extent to which the indicators of consumer confidence and expectations have an effect on current consumption or future macroeconomic indicators have been the subject of many studies in the literature (Zagorski and McDonnell, 1995). In these studies examining the relationship with macroeconomic variables, confidence indices are used to measure expectation and confidence. Confidence indices aim to produce indicators that reflect short-term trends (TCMB, 2020) by monitoring economic agents' recent assessments, their views on the current situation and their future expectations. In this context, most of the empirical studies investigating the existence and causality of the relationship between macroeconomic variables and confidence have used confidence indices, and although it has been concluded that confidence indices are related to different macroeconomic variables in many studies, number of studies in the literature that test the relationship between public economy variables and confidence is limited. However, the different decisions and policies of the state, which is one of the economic agents, can be effective on economic decisions and confidence. In this context, budget deficits and public debt stock, which affect many variables such as interest, inflation, exchange rate, current account deficit, may affect economic confidence directly or indirectly. On the other hand, decreasing public debt by efficient debt management, may affect confidence and risk perception (Saat, 2020). The determination of the existence of such an effect will be a variable to be taken into account, especially when establishing public borrowing policies. In this context, it is aimed to test the hypothesis that the public debt stock may have an effect on consumer and real sector confidence. Although the relationship between many macroeconomic variables and confidence has been analyzed using different econometric methods in the literature, as far as I can reach, this study is the first study to examine the relationship between public debt stock and confidence by using a hidden cointegration method.

In this study, it is aimed to test the hypothesis that the public debt stock may have an effect on consumer and real sector confidence. Within the context of today's economies, particularly following the global economic crisis of 2008, the effect of public debt stock, which generally follows an upward trend in emerging countries and fragile economies, on confidence will be handled under the scope of this study with specific emphasis on Turkey where the public debt stock is relatively fluctuating.

As seen in Graph 1, in Turkey, which is a developing economy, there is an upward trend in public debt stock within the scope of public deficits that have been increasing since 2016. As a matter of fact, public debt in Turkey, which was 0.02% in 2016, increased to 19% in 2020. This increase in government borrowing can have an impact on both consumer and real sector economic decisions. In this context, an issue which is as important as how the economic growth of Turkey as a developing country is affected from investment and saving decisions is whether the real sector and consumer confidence index which are effective on many macroeconomic variables is affected from this increase. In this context, in this study, the relationship between public debt stock and confidence indices is discussed within the scope of linear and nonlinear causality tests.

**Graph 1.** GDP Ratio of Public Debt in Turkey between the years of 2007-2020 (%)
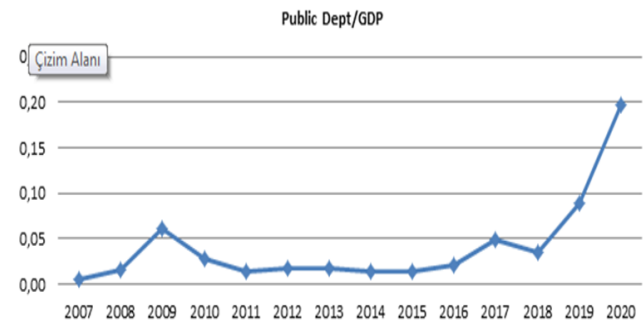


Source: TR Ministry of Treasury and Finance (2020)

The study which consists of four sections, the second section includes the theoretical framework and the literature review, the third section includes the econometric analysis results, and the last section includes evaluations about the results achieved.

## 2. Literature Review

Confidence indices obtained by survey method reflect the economic perspectives of consumers and producers. First of all, confidence indexes were created with the surveys on the behavior and expectations of consumers as a result of the studies conducted by George Kantona (1960 and 1968) at the Survey Research Center at the University of Michigan, and over time, there have been different practices across countries. Despite different applications, confidence indices are closely followed by the economic circles in the economies of developed countries and it is stated that they play a key role especially for short-term economic developments (Ludvigson, 2014). In addition, the strong correlations of confidence indices with economic and financial variables show that these indicators are useful for monitoring economic developments (Dees and Brinca, 2011).

In this context, the relationship between confidence indices and macroeconomic variables has been investigated in many different empirical studies in the economic literature.

In their studies, Matsusaka and Sbordone (1995), Knack and Keefer (1997), Zak and Knack (2001), Afshar (2007), Mermod et al. (2010), Islam and Mumtaz (2016), Utaka (2003), Sergeant (2011) analyzed the relationship between confidence index and economic growth, and Otoo (1999), Spreng and Page (2001), Jansen and Nahius (2003), Fisher

and Statman (2003), Christ and Bremmer (2003) tested the relationship between confidence index and prices of share certificates. Apart from these studies, the relationship of confidence index with investment (Abaidoo, 2012), inflation (Galesi and Lombardi, 2009), interest rates (King and Kurmann 2002) and exchange rate (Akhtar, et al., 2011) has been the subject of different studies. As can be seen, while the relationship between confidence indices and many macroeconomic variables has been the subject of the literature, their relationship with public economy variables has been studied in a very limited number of studies. However, with the aim of maximizing social welfare, which is the main objective of the state, expenditures and taxes are among the main fiscal policy tools it uses while fulfilling the functions of allocation, distribution, stability, and income, and economic decisions and expectations. Confidence in the state, on the other hand, increases confidence by influencing economic decisions such as investment and consumption (OECD, 2013). In this context, Calvo referred to the relationship between public debt and expectations in his study in 1988, then Bachman and Sims discussed the relationship between public expenditures and confidence in their 2012 study. In the study, it has been determined that the increase in public investment expenditures compared to consumption has a positive effect on confidence. The studies of Bachman and Sims (2012) formed the starting point of this study. The positive relationship between public investment expenditures and confidence raises the question of how the increase in public debt caused by public deficits due to the increase in public expenditures will affect confidence.

In this study will examine the relationship between public debt stock and confidence indices, unlike other studies. The public debt stock, which increases due to public deficits, creates an exclusion effect on the economy and affects many macroeconomic variables (inflation, interest rates, investment, savings, etc.). In this context, public debt stock may affect expectations and confidence directly or indirectly.

## 3. Data and Methodology

Quarterly data between 2007Q1-2020Q1 period is used in order to analyze the relationship consumer confidence index and real sector confidence index. GDP ratio of net public debt stock and index data were obtained from the Central Bank of the Republic of Turkey data. In this context, the relationship between the public debt stock and the real sector confidence index is considered under model 1, and its relationship with the consumer confidence index under model 2. In the analysis, the GDP ratio of the public debt stock (pd), the Real sector confidence index (rindex), and the consumer confidence index (index) are represented.

In the empirical part of the study, it was first examined whether the variables contain unit root or not. Many macroeconomic time series may contain unit root (Nelson and Plosser, 1982). In predictions using unit root series, the existence of unrealistic relationships between series may

come to the fore, and this situation may invalidate the predictions made. For this reason, unit root tests and results of the analyzed series are important for the reliability of reliable econometric analysis. At this point, firstly, the unit root analysis of the series used in the analysis was performed in our study and the Extended Dickey Fuller (AUG) and Phillips-Perron and Kwiatkowsky-Philips-Schmidt-Shin (KPSS) tests were applied for the analysis in question.

Although Dickey Fuller test is the basis of unit root tests, Dickey Fuller (DF) test may be insufficient if error terms include autocorrelation (Madala and Kim, 1998: 75-76). For this reason, the Augmented Dickey Fuller (ADF) test, which is obtained by including the lagged values of the dependent variable in the Dickey Fuller unit root test into the model as an independent variable, was used in this study. In terms of the reliability of the results, the series were also tested with Philips-Perron (1988) unit root test using a nonparametric approach.

**Table 1.** Unit Root Tests Results

| Variables | ADF statistics (level) | MacKinnon 5% critical value | PP statistics (level) | MacKinnon 5% critical value |
|---|---|---|---|---|
| pd | -1.452724 | -2.923780 | -1.656513 | -2.921175 |
| index | -0,780902 | -2,948404 | -0,791255 | -2,945842 |
| rindex | -1.644524 | -2.960411 | -1.476777 | -2.960411 |
| Variables | ADF statistics (first degree difference) | MacKinnon 5% critical value | PP statistics (first degree difference) | MacKinnon 5% critical value |
| Δpd | -2.787355 | -1.947816 | -4.864087 | -2.922449 |
| Δindex | -5.553413 | -2.922449 | -5.407003 | -2.922449 |
| Δrendex | -6.619111* | -2.963972 | -6.852247* | -2.963972 |

As a result of both tests, the null (basic) hypothesis was accepted that the variables contain unit roots. Although the variables contain unit roots at the level, their first order differences are stationary. In addition to these two tests, the KPSS test, which is less sensitive to the choice of lag length and therefore recommended to support the results of ADF and PP tests (Maddala & Kim, 1998), was included in the tests. The results obtained in this context are given in Table 2.

**Table 2.** KPSS Test Results

| Variables | KPSS 5% Critical Value | KPSS Test Results (level) |
|---|---|---|
| pd | 0.463000 | 0.769119 |
| index | 0.463000 | 0.088395 |
| rindex | 0.463000 | 0.459590 |
| Variables | KPSS 5% Critical Value | KPSS Test Results (initial difference) |
| Δpd | 0.463000 | 0.354245 |
| Δindex | 0.463000 | 0.060127 |
| Δrindex | 0.463000 | 0.677321 |

Unlike other tests in the KPSS test, the null (basic) hypothesis is that the series are stationary. In the light of the results in Table 2, it is concluded that the variables are

stationary in the first order difference. In the three-unit root tests carried out in this context, the fact that the variables are not level but stationary in the first-order differences raises the question of the cointegration relationship between the variables. In this direction, within the scope of Pantula principle, starting from the most restricted hypothesis, the cointegration test containing linear deterministic trend was applied by comparing the trace statistics and critical values, and the results in Table 3 and Table 4 were reached within the scope of model 1 and model 2 with the application of Trace statistics and Maximum Eigenvalue Statistics.

**Table 3.** Johansen Cointegration Test Results for Model 1

| $H_0$  $H_1$ | $\lambda$trace | Critical Value (%5) | $\lambda$max | Critical Value (%5) |
|---|---|---|---|---|
| r=0 r≥1 | 12.91406 | 15.49471 | 10.14712 | 14.26460 |
| r≤1 r≥2 | 2.766938 | 3.841466 | 2.766938 | 3.841466 |

Note: * Significant at 1%, ** Significant at 5%, *** Significant at 10%.

**Table 4.** Johansen Cointegration Test Results for Model 2

| $H_0$  $H_1$ | $\lambda$trace | Critical Value (%5) | $\lambda$max | Critical Value (%5) |
|---|---|---|---|---|
| r=0 r≥1 | 12.40529 | 15.49471 | 11.86857 | 14.26460 |
| r≤1 r≥2 | 0.536720 | 3.841466 | 0.536720 | 3.841466 |

Note: * Significant at 1%, ** Significant at 5%, *** Significant at 10%.

In the light of the results in Table 3 and Table 4, it was seen that the trace and maximum Eigenvalue statistics did not indicate the cointegrated vector between the variables.

The absence of a standard cointegration relationship between variables also means that there is no long-term relationship.

Within the scope of this result, Granger and Yoon (2002) and Hatemi-J and Irandust (2012) tests were applied in order to test the existence of a hidden relationship between variables. Based on the standard Engle-Granger cointegration test, it is possible to examine the long-term relationship between the positive and negative components of the series with the latent cointegration analysis proposed by Granger and Yoon (2002). Hatemi and Irandoust, on the other hand, examined the hidden cointegration using the Johansen cointegration method.

$$X_t = X_{t-1} + \varepsilon_t = X_0 + \sum_{i=1}^{t} \varepsilon_i \qquad (1)$$

$$Y_t = Y_{t-1} + \eta_t = Y_0 + \sum_{i=1}^{t} \eta_i \qquad (2)$$

Here the Equation 1 and 2 express the $X_0$ and $Y_0$ start values and ε and η indicate the 0 average white noise error terms. Valuables for which cointegration relation between them will be examined are not the $X_0$ $Y_0$ but the positive and negative components of the said variables. Equations 3 and 4 are defined to examine the hidden cointegration relationship of positive and negative components.

$$\varepsilon_i^+ = maks(\varepsilon_t, 0), \qquad \varepsilon_i^- = (\varepsilon, 0) \qquad (3)$$
$$\eta_i^+ = maks(\eta_i, 0), \qquad \eta_i^- = (\eta, 0) \qquad (4)$$

The error terms included in the equations No. 3 and 4 could be defined as $\varepsilon_i = \varepsilon_i^+ + \varepsilon_i^-$ ve $\eta_i = \eta_i^+ + \eta_i^-$ . In this context, equations 1 and 2 can be expressed as follows.

$$X_t = X_{t-1} + \varepsilon_t = X_0 + \sum_{i=1}^{t} \varepsilon_i^+ + \sum_{i=1}^{t} \varepsilon_i^- \qquad (5)$$

$$X_t = X_{t-1} + \eta_t = X_0 + \sum_{i=1}^{t} \eta_i^+ + \sum_{i=1}^{t} \eta_i^- \qquad (6)$$

When X and Y variables are arranged as equations (7) and (8):

$$X_t = X_0 + X_i^+ + X_i^- \qquad (7)$$
$$Y_t = Y_0 + Y_i^+ + Y_i^- \qquad (8)$$

In equations No. 7 and 8 no the positive component is expressed as $X_t^+ = \sum_{i=1}^{t} \varepsilon_i^+$ , $Y_t^+ = \sum_{i=1}^{t} \eta_i^+$ and the negative components are expressed as $X_t^- = \sum_{i=1}^{t} \varepsilon_i^-$ , $Y_t^- = \sum_{i=1}^{t} \eta_i^-$ and the changes in positive and negative components are expressed as $\Delta X_t^+ = \varepsilon_i^+$ , $\Delta Y_t^+ = \eta_i^+, \Delta X_t^- = \varepsilon_i^-, \Delta Y_t^- = \eta_i^-$ .

As a result, when Engle-Granger cointegration analysis is applied to positive and negative components, Granger-Yoon (2002) latent cointegration analysis is performed, and when Johansen cointegration analysis is applied, Hatemi_J and Irandoust (2012) latent cointegration analysis is performed. As a matter of facts, in the studies of Hatemi_J and Irandoust (2012), the method in the studies of Grander and Yoon(2002) was used and the first degree differences of all variables $(\Delta X_t = X_t - X_{t-1})$ and negative and positive components of variables ($\Delta X_t^+$ ve $\Delta X_t^-$) were taken, and further the cumulative sum of positive (negative) variables in a certain time ( $X_t^+ = \sum \Delta X_t^+$ ve $X_t^- = \sum \Delta X_t^-$) was calculated for X and Y variables. Since the existence of a cointegration relationship between the components of the variables will prove the existence of hidden cointegration between the X and Y variables, Hatemi j and Irandoust (2012) used the Johansen cointegration analysis at this stage.

In this context, firstly the positive and negative components of the variables were determined and the unit root test of these components was made. Unit root tests where the stability of the variables are tested are given in Table 5.

It was determined that the first-degree difference of the public debt stock positive variable was stable at the 5% significance level, and the positive and negative components of all other variables at the 1% significance level. The fact that the positive and negative components of the variables are equally stable brings out the existence of a hidden cointegration relationship between variables.

**Table 5.** Unit Root Test of Positive and Negative Components of Variables

| Variables | ADF statistics (fixed) | MacKinnon 5% critical value | ADF statistics (fixed and trend) | MacKinnon 5% critical value |
|---|---|---|---|---|
| pd+ | 1.121619 | -2.922449 | -0.116328 | -3.504330 |
| index+ | -2.330316 | -2.926622 | -2.079866 | -3.548490 |
| rindex+ | -0.554504 | -2.963972 | -3.066666 | -3.568379 |
| pd- | -2.210352 | -2.922449 | 0.263168 | -3.504330 |
| index- | -2.458179 | -2.922449 | -3.387176 | -3.506374 |
| rindex- | 0.223503 | -2.967767 | -2.734846 | -3.574244 |

| Variables | ADF statistics (first degree difference, fixed) | MacKinnon 5% critical value | ADF statistics (first degree difference, fixed and trend) | MacKinnon 5% critical value |
|---|---|---|---|---|
| $\Delta$pd+ | -3.359908** | -2.925169 | -6.269857* | -3.506374 |
| $\Delta$index+ | -4.560468* | -2.925169 | -4.829810* | -3.508508 |
| $\Delta$rindex+ | -6.655826* | -2.967767 | -6.541282* | -3.574244 |
| $\Delta$pd- | -3.120721* | -2.925169 | -4.814808* | -3.506374 |
| $\Delta$index- | -3.920280* | -2.925169 | -4.148946* | -3.508508 |
| $\Delta$rindex- | -5.649149* | -2.967767 | -5.601549* | -3.574244 |

Note: * Significant at 1%, ** Significant at 5%, *** Significant at 10%.

**Table 6.** Granger and Yoon (2002) Hidden Cointegration Test Results for Model 1

| Dependent | tau-statistic | Prob.* | z-statistic | Prob.* |
|---|---|---|---|---|
| pd- | -2.027895 | 0.5191 | -7.649679 | 0.4923 |
| index- | -2.769458 | 0.1939 | -11.53498 | 0.2384 |
| pd- | -2.562838 | 0.0692 | -19.59784 | 0.0340** |
| index+ | -3.324322 | 0.0690 | -36.19105 | 0.0001* |
| pd+ | -1.423932 | 0.7917 | -12.42525 | 0.1968 |
| index- | -2.388969 | 0.3429 | -13.53361 | 0.1542 |
| pd+ | 0.073958 | 0.9902 | 0.246029 | 0.9911 |
| index+ | -1.185994 | 0.8626 | -3.449487 | 0.8453 |

When the Granger and Yoon (2002) test results are examined within the scope of Model 1 in Table 6, it is seen that there is a two-way cointegration relationship between pd- and index + variables. In this context, a negative random shock to the public debt stock acts together with a positive shock effect on the real sector confidence index.

**Table 7.** Granger and Yoon (2002) Hidden Cointegration Test Results for Model 2

| Dependent | tau-statistic | Prob.* | z-statistic | Prob.* |
|---|---|---|---|---|
| rindex+ | -1.703404 | 0.6789 | -4.449878 | 0.7606 |
| pd+ | -0.845949 | 0.9272 | -2.497734 | 0.9064 |
| rindex+ | -0.220914 | 0.0980 | -0.481317 | 0.0981** |
| pd- | -1.964276 | 0.0553 | -4.114371 | 0.0789** |
| rindex- | 0.479513 | 0.9970 | 0.918440 | 0.9963 |
| pd- | -1.716115 | 0.6731 | -3.458090 | 0.8422 |
| rindex- | -1.969591 | 0.5513 | -4.765880 | 0.7325 |
| pd+ | -1.200497 | 0.8592 | -3.381460 | 0.8479 |

When the Granger and Yoon (2002) test results are examined within the scope of Model 2 in Table 7, it is seen that there is a two-way cointegration relationship between

pd- and rindex+ variables. In this context, a negative random shock to the public debt stock acts together with a positive shock effect on the real sector confidence index.

In this context, hidden error correction models (CECM) were estimated in the examination of the relationship between variables in accordance with Model 1 and Model 2.

**Table 8.** CECM for Model 1

| Dependent Variable | Independent Variable | |
|---|---|---|
| | $\Delta$index+$_{t-1}$ | ---- |
| $\Delta$index+ | $\Delta$pd-$_{t-1}$ | -0.190244** |
| | ECT$_{t-1}$ | -0.924952** |
| | $R^2$ | 0.91 |

**Table 9.** CECM for Model 2

| Dependent Variable | Independent Variable | |
|---|---|---|
| | $\Delta$rindex+$_{t-1}$ | ---- |
| $\Delta$rindex+$_{t-1}$ | $\Delta$pd-$_{t-1}$ | 0.315732** |
| | ECT3$_{t-1}$ | -0.296495*** |
| | $R^2$ | 0.81 |

In the interpretation of hidden error correction models, all coefficients are expected to be statistically significant and the error correction coefficient to be negative and significant. Under these conditions, it is assumed that equilibrium will be reached in long rotation between variables. When Table 8 and Table 9 are examined under these assumptions, the long-term dynamics in the system under Model 1 and Model 2 are determined by the public debt stock in model 1 and model 2. In other words, pd-variable is the long-term asymmetric cause of index + and rindex + variables. In the light of these findings, at the last stage of the study, the hidden relationship between variables in the Hidden Cointegration Analysis of Hatemi j and Irandoust (2012) was examined and the results in Table 10 and Table 11 were reached between the variables in model 1 and model 2.

In the light of the results obtained in Table 10, it is seen that the trace and maximum Eigenvalue statistics indicate a single cointegrated vector. In the light of the aforementioned results, it was determined that there is 1 hidden cointegrated relationship between index + and pd-variables. In light of these findings, it could be said that in Turkey, there is a relation between real sector confidence index cumulative positive shocks and public debt negative shocks in the long run. In other words, negative shocks in the public debt stock in the long run affect the real sector confidence positively. In the light of these findings, the long-term equilibrium model obtained from the implicit cointegration analysis is as follows:

$$index+ = 0.062881 + 0.15901pd -$$
$$(0.03194) \quad (0.00494)$$

**Table 10.** Khatami j and Irandoust (2012) Hidden Cointegration Analysis Results for Model 1

| Dependent Variable | Independent Variable | Null Hypothesis / | Alternative Hypothesis | λtrace | Critical Value (5%) | Null Hypothesis / | Alternative Hypothesis | λmax | Critical Value (5%) |
|---|---|---|---|---|---|---|---|---|---|
| index+ | pd+ | $r = 0$ | $r \geq 1$ | 8.906309 | 15.49471 | $r = 0$ | $r = 1$ | 7.474633 | 14.26460 |
| | | $r \leq 1$ | $r \geq 2$ | 1.431676 | 3.841466 | $r = 1$ | $r = 2$ | 1.431676 | 3.841466 |
| index+ | pd- | $r = 0$ | $r \geq 1$ | 16.54250** | 15.49471 | $r = 0$ | $r = 1$ | 14.29812** | 14.26460 |
| | | $r \leq 1$ | $r \geq 2$ | 3.244379 | 3.841466 | $r = 1$ | $r = 2$ | 3.244379 | 3.841466 |
| index- | pd+ | $r = 0$ | $r \geq 1$ | 18.70346 | 15.49471 | $r = 0$ | $r = 1$ | 17.88753 | 14.26460 |
| | | $r \leq 1$ | $r \geq 2$ | 0.815938 | 3.841466 | $r = 1$ | $r = 2$ | 0.815938 | 3.841466 |
| index- | pd- | $r = 0$ | $r \geq 1$ | 14.94424 | 15.49471 | $r = 0$ | $r = 1$ | 14.03343 | 14.26460 |
| | | $r \leq 1$ | $r \geq 2$ | 0.010816 | 3.841466 | $r = 1$ | $r = 2$ | 0.010816 | 3.841466 |

**Table 11.** Khatami j and Irandoust (2012) Hidden Cointegration Analysis Results for Model 2

| Dependent Variable | Independent Variable | Null Hypothesis / | Alternative Hypothesis | λtrace | Critical Value (5%) | Null Hypothesis / | Alternative Hypothesis | λmax | Critical Value (5%) |
|---|---|---|---|---|---|---|---|---|---|
| rindex+ | pd+ | $r = 0$ | $r \geq 1$ | 11.93832 | 15.49471 | $r = 0$ | $r = 1$ | 11.57114 | 14.26460 |
| | | $r \leq 1$ | $r \geq 2$ | 0.367185 | 3.841466 | $r = 1$ | $r = 2$ | 0.367185 | 3.841466 |
| rindex+ | pd- | $r = 0$ | $r \geq 1$ | 17.81988** | 15.49471 | $r = 0$ | $r = 1$ | 14.76898** | 14.26460 |
| | | $r \leq 1$ | $r \geq 2$ | 3.050903 | 3.841466 | $r = 1$ | $r = 2$ | 3.050903 | 3.841466 |
| rindex- | pd+ | $r = 0$ | $r \geq 1$ | 9.904276 | 15.49471 | $r = 0$ | $r = 1$ | 9.133949 | 14.26460 |
| | | $r \leq 1$ | $r \geq 2$ | 0.770327 | 3.841466 | $r = 1$ | $r = 2$ | 0.770327 | 3.841466 |
| rindex- | pd- | $r = 0$ | $r \geq 1$ | 9.314669 | 15.49471 | $r = 0$ | $r = 1$ | 7.561742 | 14.26460 |
| | | $r \leq 1$ | $r \geq 2$ | 1.752928 | 3.841466 | $r = 1$ | $r = 2$ | 1.752928 | 3.841466 |

In the light of the results obtained in Table 11, it is seen that the trace and maximum Eigenvalue statistics indicate a single cointegrated vector. In the light of the aforementioned results, it was determined that there is 1 hidden cointegrated relationship between rindex + and pd-variables. In light of these findings, it could be said that in Turkey, there is a relation between consumer confidence index cumulative positive shocks and public debt negative shocks in the long run.

$$rindex += 0.654957 + 0.32797pd -$$
$$0.19788 \qquad (0.11665)$$

## 4. Conclusion

Under the light of all these analyses, between periods 2007Q1-2020Q1, it has been concluded that there is a long-term hidden relationship between public debt stock and real sector confidence index in Turkey and the public debt stock and consumer confidence index variables. In other words, it has been determined that there is a non-linear hidden relationship between the variables in the absence of a linear causality relationship. It was observed that, in the period examined, within the scope of Granger and Yoon (2002) and Hatemi-J and Irandust (2012) hidden cointegration models, the incremental negative shocks of public debt stock and the incremental positive shocks of real sector confidence index, and the incremental negative shocks of public debt stock and the incremental positive shocks of consumer confidence index, moved together. In other words, there is a long-term relationship between the decrease in public debt stock and a positive increase in the real sector confidence index and consumer confidence index.

Accordingly, decreasing movements in public debt stock have been found to have a positive effect on both household and real sector confidence. The results discussed in this context reveal that public expenditure and borrowing policies are effective on confidence, as in the studies of Bachman and Sims (2012), in which the positive relationship between public investment expenditures and confidence was determined. Increasing public debt burden will have a negative impact on maintaining and enhancing the factor of confidence that has an impact on the economic decisions of households and the private sector. Especially for developing countries that need savings and investments, the negative effects of public deficits and the increase in public debt stock on confidence indices pose a threat to economic growth. In this context, it is important to ensure fiscal discipline and a sustainable borrowing by using public expenditures effectively and efficiently in order to maintain confidence in the economy. It is important to ensure fiscal discipline and a sustainable borrowing by using public expenditures effectively and efficiently in order to maintain confidence in the economy. Otherwise, the reduced confidence in the economy may create more negative consequences on the public balance in the medium and long term. This situation may adversely affect economic growth and development in the long run.

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