sciendo

Zagreb International Review of Economics & Business, Vol. 23, No. 1, pp. 121-140, 2020

ISSN 1331-5609; UDC: 33+65
DOI: 10.2478/zireb-2020-0008

The Nexus between Economic Sentiment Indicator and Gross Domestic Product; a Panel Cointegration Analysis

Daniel Tomić [*]
Jurica Šimurina [**]
Luka Jovanov [*]

Abstract: *Economic Sentiment Indicator (ESI) became the most popular composite indicator within the EU with the purpose of monitoring and/or forecasting business cycles in one country or for a region as a whole. Since it is calculated regularly, on a monthly base, and is based on five distinct confidence indicators, the main concern is whether the ESI can be explained and/or can explain the current, past or future values of relevant macroeconomic variables. This implies its relevance in predicting both short- and long-term economic outcomes of, for example, variation in income, unemployment fluctuations, consumption change, inflation modifications, sectoral alterations and etc. The question that arises often in academic, as well as within the EU decision-making circles is whether the ESI be used as an explanatory variable with valuable information for modelling the national output developments. Therefore, the aim of this paper is to reveal the true strength and significance in the ESI-GDP nexus for the EU. Empirical research is based on panel cointegration analysis that utilizes data on the ESI and GDP over the period 2000-2018 for the EU28 countries. The causal relationship between the variables appears to be consistent in the short- and long-run across the panel, suggesting that ESI movements do explain movements in national output, hence can help both private and public sector decision-makers to evaluate their goals and plan their actions.*

Keywords: Economic sentiment indicator; GDP; business cycles; panel cointegration analysis; European Union

JEL Classification: C33, E24, F02

[*] Daniel Tomić and Luka Jovanov are at Faculty of Economics and Tourism "Dr. Mijo Mirković", Pula, Croatia.
[**] Jurica Šimurina is at Faculty of Economics and Business, University of Zagreb, Zagreb, Croatia.

Introduction

Following the Joint Harmonised EU Programme of Business and Consumer Surveys in 1961, Commission's Directorate General for Economic and Financial Affairs computes the European Economic Sentiment Indicator (ESI). Every month, the European Commission publishes the ESI. The ESI is a complex indicator that consists of a total of five sectoral confidence indicators with different weights: Industrial confidence indicator, Services confidence indicator, Consumer confidence indicator, Construction confidence indicator, Retail trade confidence indicator. Confidence indicators are the arithmetic means of seasonally adjusted balance of answers to a selection of questions closely related to the reference variable they are supposed to track. ESI has over time become the most popular composite indicator within the EU with tracking and/or predicting business cycles in one country or the region as a whole. It is calculated on a regular basis, on a monthly basis and prior official statistical data. The ESI index begins to be computed in 1985, and within that, individual growth is observed in all sectors covered by confidence indicators. The explicit weights assigned to all confidence indicators are assigned to compute the composite index, which is a more complex indicator. The data required for the calculation of the ESI are collected according to the Statistical Classification of Economic Activities in the European Community. This is a composite index based on a survey aimed at gaining insight into the state of the economy, both on the demand side and on the supply side. The ESI index basically represents a simple, weighted average of standardized survey responses. The weights for a certain confidence are, as already stated arbitrarily selected by the European Commission, and no major revision of the indicators has been made since the introduction of the ESI. Since the ESI mainly reflects the attitudes, perceptions and expectations of the economy as a whole, the usual reference variable is the GDP growth rate.

Researchers and the decision makers often dwell whether the ESI can be used as an explanatory variable with relevant information for modelling national production development. For this reason, the aim of this paper is to discover the true strength and importance of ESI-GDP nexus for the EU. The paper identifies whether the ESI can provide some valuable information on the development of real GDP for all 28EU countries, both in the short and long term. Empirical research is based on panel cointegration analysis that utilizes data on the ESI and GDP over the period 2000-2018 for the EU28 countries. The analysis starts with conducting a battery of panel unit root tests. The empirical core of the research is a panel cointegration analysis. The long-run relationship is estimated using the pooled Panel Fully Modified Least Squares (FMOLS), pooled Panel Dynamic Least Squares (DOLS) and Pooled Mean Group/AR Distributed Lag (PMG/ARDL) estimation methods. While Section 2 describes theoretical background. Section 3 contains research data and methodology. Section 4 gives a full perspective to the analytical part by describing used methodology, data and the results whereas Section 5 provides some concluding remarks.

Theoretical background

Theory

Every month, the European Commission publishes the European Economic Sentiment Indicator (ESI). ESI is an indicator based on a survey that aims to provide insight into the credentials of economic entities, both on the demand side and on the supply side of the economy. If consumers and manufacturers are confident in the current and future economic situation, then they can increase their spending and production. In addition, mood data provide new information as they are available before most of the economic indicators such as GDP or industrial production (Gelper and Croux, 2010). The ESI represents a weighted average of the balances of selected questions addressed to firms and consumers in five sectors covered by the EU Business and Consumer Surveys Programme. The weights underlying the ESI are fixed as follows: (weight 40%), services (30%), consumers (20%), retail (5%) and construction (5%). Balances are constructed as the difference between the percentages of respondents giving positive and negative replies. The Commission calculates EU and euro area aggregates on the basis of the national results and seasonally adjusts the balance series. The indicator is scaled in a way that it has a long-term average value of 100 and a standard deviation of 10. Specifically, values greater than 100 indicate over-average economic mood and vice versa (European Commission, 2010). Financial services are not included in the ESI. This may be a disadvantage because the financial sector affects real GDP, and developments in the financial sector may be very different from those in the rest of the economy, as evidenced during the financial crisis (ECB, 2017).

In the last five decades the ESI has proved to be a high-quality leading indicator of overall economic activity. The purpose of constructing an aggregate indicator is to summarize the information contained in a large number of series into one single indicator series. In our setting, a series corresponds to a particular question from one of the 5 sentiment surveys, and we have such a series for every EU member state (Gelper and Croux, 2010). Based on data from five different business and consumer survey sectors (industry, retail trade, services, construction and the consumer sector), the ESI was realised as a weighted average of the selected 15 survey responses. The ESI Indicator report consists of business and consumer surveys collected by the European Commission. The surveys provide essential information for economic surveillance, short-term forecasting and economic research. The data are derived from surveys conducted by national institutes in the European Union Member Stats and candidate countries (Sorić, Lolić and Čižmešija, 2015).

The European Commission's surveys have a broad coverage in terms of countries (all euro area countries are covered except Ireland), sectors, questions and sample size (it comprises 75,000 private sector companies and 26,000 consumers) (ECB,

2017). One of the possible ways of determining the accuracy of the ESI calculation in relation to its predictive ability is to compare with official European statistics such as STS indicators. Although research is concerned with the level of production, sales, prices or employment, expecation information may still be relevant and appropriate for tracking and forecasting business cycles before publishing official statistics (Stock and Watson, 2002).

Empirics

Haluška (2006) suggested that ESI can be considered as a statistically significant indicator of GDP development and can be used to build a rapid GDP ratio model. In addition, by comparing statistical characteristics of acquired relationship, the author explained that their exploratory power differs – as far as past in concerned – and is significantly higher in the ECM model. Following this logic, it can be assumed that the potential to improve the explanatory power of these relationship patterns, and thus the reliability of GDP estimates, depends primarily on expanding the ESI with a confidence indicator in services. Biau and D'Elia (2010) concluded that after March 2009, the ESI for the European region has been growing steadily for about two years. However, this steady recovery of feelings did not entirely reflect real GDP growth. Conflicted signals about the power of recovery prompted some analysts to reconsider the relationship between hard and soft indicators and expressed doubts about the usefulness of the information from the survey in predicting economic growth. The major part of the change in the relationship between ESI and GDP growth over the past decade occurred during the last crisis, when confidence was subject to temporary measurement problems. In addition, the observed separation mainly relies on the results at the end of the sample, which is usually estimated to be less robust. Therefore, the authors concluded that further observations are needed to confirm the results presented in their research.

Another relevant research on the European BCS was provided by Sorić, Škrabić and Čižmešija (2013). Authors used a separate five-bivariate VAR model for OMS and NMS, each of which contains a confidence indicator BCS and a macroeconomic variable related to the sector. The observed variables were retail trade volume, construction volume, personal consumption, industrial production (with relevant BCS confidence indicators) and GDP (paired with ESI). On the basis of standard Granger causality tests and innovation analysis, it is confirmed that the predictive characteristics of NMS' BCS indicators (and ESI) are of comparable quality to the same indicators in OMS. The authors concluded that all of the BCS variables Granger-cause their macroeconomic tendencies (with a lag of 4 quarters). Such conclusion is also confirmed by WHO and NMS. Finally, the authors suggest that the predictive accuracy of the BCS indicator could be improved. Sorić, Lolić and Čižmešija (2015)

concluded that in the last five decades the ESI has positioned itself as a high quality leading indicator of overall economic activity. Taking into account the data on various sectors of business and consumer research (industry, retail, services, construction and consumer sectors), they state that ESI is designed as a weighted average of the selected 15 responses. However, they consider that the official methodology of ESI calculation is very misleading because of the arbitrarily chosen weights of the response to the balance. For this reason, this research suggested two alternative methods for gaining new weights by increasing ESI's predictive power. Weights are determined by minimizing the average quadratic error in simple regression equations of GDP prediction; and maximizing the coefficient of correlation between ESI and GDP growth for different lead lengths (up to 12 months). It can be concluded that the methods used significantly increased ESI's prediction accuracy in 26 individual EU countries. The results obtained indicate the robustness in all specifications.

One of the most influential studies on this topic was created by Gayer (2005). The author estimated several VAR models on aggregated Eurozone data. All models include GDP growth and one of the leading BSC sector indicator or ESI. Standard Granger-causality tests suggested pronounced predictive characteristics of the BSC indicator. However, sample-based VAR based GDP forecasts revealed a much more informative view of the problem. The results of the research strongly suggested that BSC indicators can only be used as short-term GDP forecasters (one or two quarters in advance). From the observed indicators, ESI provides the highest added value in comparison with the reference GDP model. Silgoner (2007) analyzed several different BCS indicators and their predictive properties at EU level and for each country individually. Using Granger causality tests, correlation analysis and panel data models, the author found that the ESI offers the highest "added value" in short-term forecasts. The above-mentioned suggests the relevance of ESI in short-term estimates and forecasts.

Data & Methodology

The literature on panel cointegration has been expanding rapidly, responding to the complex nature of interactions and dependencies that exist over time and across the individual units in the panel (Breitung and Pesaran, 2005). Many authors have generally confirmed that it is the span of the data, rather than frequency that matters for the power of this approach (Pedroni, 1997). On the other hand, the pooling of time series is traditionally related to the substantial degree of sacrifice in the terms of possible heterogeneity of individual time series, therefore, testing the unit root and cointegration hypothesis by using panel data involves several serious complications such as mentioned unobserved heterogeneity, the question of independence of cross-section units, panel results are often difficult to interpret, and etc. Nonetheless,

the growing popularity of panel cointegration is due to good reasons: first many important economic questions are naturally framed in a panel perspective, and second, adding the cross-section dimensions grants considerable improvements to the small sample properties of testing procedures, provided the possible linkages across units are properly accounted for (Di lorio and Fachin, 2011). Considering the plausibility of the results in this area, we opted for panel cointegration method. Even though panel results may be biased by specific county experience, time averages, unbalanced feature, etc., the problem of not sufficiently long time series lead us to the panel cointegration aspect of research. Few series have missing observation, which not only makes panel unbalanced but also reduces the effective number of observable time series, thus making the cross-sectional dimension a very important source of information for us. Another important feature is that use of panel cointegration framework can ensure econometrically robust results. Next, unit root tests are often limited to results from few generally applied tests that are relevant for individual time series, yet a number of more sophisticated procedures of unit root testing are nowadays available for panel cointegration purposes.

Annual panel data on ESI and GDP covering the period 2000-2017 for 28 EU countries are taken from the Eurostat and World Bank databases. Countries involved in the analysis are: Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovak Republic, Finland, Sweden and the United Kingdom. Data are expressed in logarithms and presented as[1]: *lnGDP* for real gross domestic product (2010=100)[2] and *lnESI* for Economic confidence indicator.[3] Graphical display of the variables in provided in the *Appendix*. All countries experienced similar dynamics in ESI with one dip around the time of global economic crisis, with some countries experiencing double dip (such as Denmark, Italy, Luxembourg, Poland, Portugal and Slovenia) in the aftermaths of the crisis. Non-the-less, this indicator displayed relatively compatible trend across all the countries, suggesting similar trend in economic confidence in the EU. On the other hand, only Greece, Italy and Portugal showed some distinct behaviour in the GDP variable, mainly due to a large abrupt fall in its aggregate economic activity between 2009 and 2012. With relatively congruent behaviours across the whole EU, it would be interesting to reveal the real bond between the real GDP and ESI measure.

Cointegration analysis with panel data is similar to cointegration usually employed in time series analysis and consists of unit root tests, cointegration tests and the estimation of long-run (and short-run) relationship. In this part we followed methodological explanations based on the paper from Škare, Benazić and Tomić (2016).

Unit root tests

The analysis starts with conducting a battery of panel unit root tests, as it is very important to determine the order of integration of a time series in order to avoid spurious results, especially since macroeconomic variables are often characterized by non-stationarity. If the series are integrated (non-stationary), the analysis continues with testing for the panel cointegration. Otherwise, a short-run interpretation is appropriate. Therefore, to test the order of integration following panel unit root tests are considered: LLC test (Levin, Lin and Chu, 2002), Breitung test (Breitung, 2000), IPS test (Im, Pesaran and Shin, 2003), Fisher-type tests using ADF and PP tests (Maddala and Wu, 1999 and Choi, 2001) and Hadri test (Hadri, 2000). LLC and Breitung tests under the null hypothesis assume the common unit root process, while IPS and Fisher-type tests under the null hypothesis assume individual unit root process. Hadri test under the null hypothesis assumes no unit root (stationarity). On the other side, LLC and Breitung tests under the alternative hypothesis assume no unit root, while IPS and Fisher-type tests assume that some cross-sections are without unit root. Finally, Hadri test under the alternative hypothesis assumes unit root. For the purpose of the analysis, in the LLC, Breitung, IPS and Fisher-ADF tests, the automatic lag length selection is based on Schwarz information criterion with a maximum lag of 2. Moreover, to estimate the long-run variance in the LLC and Fisher-PP tests the Bartlett kernel was used with maximum lags determined by the Newey and West bandwidth selection algorithm.

Panel cointegration tests

For the purpose of the analysis, we evaluated panel cointegration tests according to Pedroni (1999, 2004), Kao (1999) and Maddala and Wu (1999. Pedroni and Kao extend the two-step Engle-Granger (1987) framework to tests involving panel data. Pedroni proposes several tests for cointegration that allow for heterogeneous intercepts and trend coefficients across cross-sections with two alternative hypotheses: the homogenous alternative (the within-dimension test or panel statistics test) and the heterogeneous alternative (the between-dimension or group statistics test). The Kao test follows the same approach as the Pedroni tests, but specifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors. Maddala and Wu (1999) applied Fisher's combined test (Fisher, 1932) that uses the results of the individual independent tests and Johansen's test methodology (Johansen, 1991, 1995) to propose an alternative approach to testing for cointegration in panel data by combining tests from individual cross-sections in order to obtain test statistics for the full panel. These tests may provide unreliable results since they require correct specifications and individual testing. Due to assumed research homogeneity, within Pedroni's cointegration test the automatic lag length selection is based on Schwarz information

criterion with lags from 2 to 3 while the spectral estimation used in computing the test statistic or statistics is based on the Newey-West automatic bandwidth selection and Bartlett kernel. The same is done within the Kao cointegration test except that the automatic lag length selection is set to a maximum of 2. In the Johansen Fisher cointegration test lags interval in first differences are set to 1.

Estimation of the long-run and short-run model

The long-run relationship is estimated using the pooled Panel Fully Modified Least Squares (FMOLS), pooled Panel Dynamic Least Squares (DOLS) and Pooled Mean Group/AR Distributed Lag (PMG/ARDL) estimation methods. Since FMOLS and DOLS provide only long-run estimates, for the short-run estimation PMG/ARDL is used. All these methods assume the existence of a single cointegrating vector between panel data, which is empirically relevant, since this analysis in fact explores the relationship between two variables, i.e. real GDP and ESI measure (*lnGDP* vs. *lnESI*). Namely, we are trying to model the causal relationship from ESI to the real GDP. Phillips and Moon (1999), Pedroni (2000), and Kao and Chiang (2000) proposed extensions of the Phillips and Hansen (1990) FMOLS estimator to panel settings while Kao and Chiang (2000), Mark and Sul (1999, 2003), and Pedroni (2001) propose extensions of the Saikkonen (1992) and Stock and Watson (1993) DOLS estimator. FMOLS and DOLS estimation methods for panel settings allow the estimation of panel cointegrating regression equation for non-stationary data by correcting the standard pooled OLS for serial correlation and endogeneity of regressors that are usually present in long-run relationships.

In addition, the DOLS allows augmenting the panel cointegrating regression equation with cross-section specific lags and leads to eliminate the endogenity and serial correlation. The PMG/ARDL (Pesaran, Shin and Smith, 1999) takes the cointegration form of the simple ARDL model and adapts it for a panel setting by allowing the intercepts, short-run coefficients and cointegrating terms to differ across cross-sections. Therefore, the main advantage over the FMOLS and DOLS is that it can allow the short-run dynamic specification to differ across cross-sections while the long-run coefficients are constrained to be invariant. For the purpose of the analysis, in the FMOLS and DOLS the default (homogenous variances) coefficient covariance matrix computations uses an estimator of the long-run variance computed using a Bartlett kernel and fixed Newey-West bandwidth. Moreover, in DOLS estimation method lags and leads are specified using the automatic lag length selection based on the Schwarz information criterion. In the PMG/ARDL, the automatic lag length selection of dependent variable and dynamic regressors is based on Schwarz criterion with a maximum lag of 2. Finally, to test the neutrality of the variables, zero restrictions are imposed on the long-run parameters using the Wald test.

The results

Regarding the order of integration of our time series, unit root tests indicated that the variables are integrated, i.e. they are non-stationary in level and stationary in first differences (see *Table 8* in the *Appendix*). Therefore, a panel cointegration test can be implemented. The following tables present the results of Pedroni, Kao and Johansen Fisher panel cointegration tests between the real GDP and ESI measure.

Table 1: Pedroni residual cointegration test

Variables: lnGDP, lnESI								
	Intercept				Intercept and trend			
	Statistic	Prob.	Weighted Statistic	Prob.	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	4.945756	0.0000	3.864341	0.0001	1.165041	0.1220	0.621905	0.2670
Panel rho-Statistic	-3.496315	0.0002	-3.164896	0.0008	0.587959	0.7217	0.861486	0.8055
Panel PP-Statistic	-5.393335	0.0000	-4.767095	0.0000	-2.203845	0.0138	-1.754137	0.0397
Panel ADF-Statistic	-6.424800	0.0000	-5.804254	0.0000	-3.217025	0.0006	-2.761721	0.0029
Group rho-Statistic	-0.644004	0.2598			2.599513	0.9953		
Group PP-Statistic	-5.892519	0.0000			-3.522118	0.0002		
Group ADFStatistic	-6.724627	0.0000			-4.047210	0.0000		

Source: Authors' calculations.

When only intercept is included, almost all of the Pedroni's statistics reject the null hypothesis of no cointegration between variables indicating the existence of long-run panel cointegration relationship between the observed variables. We could conclude that there exists a long-run relationship (see *Table 1*), however, results and conclusions regarding these relationships differ when intercept and trend are included. We then go further with the Kao's test. Kao's panel cointegration test strongly rejects the null hypothesis of no cointegration between variables indicating the existence of long-run panel cointegration relationship between the observed variables (see *Table 2*). According to these residual cointegration tests, we can deduce that there exists a cointegration relationship between the real GDP and ESI measure.

Table 2: Kao residual cointegration test (individual intercept)

Variables	ADF	
	t-Statistic	Prob.
lnGDP, lnESI	-5.444728	0.0000

Source: Authors' calculations.

In addition, we also evaluated the results of the combined cointegration test. Johansen Fisher trace and maximum eingevalue cointegration tests (with unrestrict-

ed constant cases) reject the null hypothesis of no cointegration between variables indicating the existence of long-run panel cointegration relationship between the observed variables (see *Table 3*). According to these results, ESI behaviour could affect the real GDP variable in the long-run. In addition, *Table 7* in *Appendix* reveals individual cross section results. From these results we can see that one cointegration relation is present in almost all countries, either in the case with unrestricted constant or in the case with unrestricted constant (except for Bulgaria and Germany). This evidence serves as a confirmation of the homogeneity of the sample.

Table 3: Johansen Fisher panel cointegration test (Trace and Maximum Eigenvalue)

Variables: lnGDP, lnESI								
Hypothesized No. of CE(s)	**No deterministic trend (restricted constant)**				**Linear deterministic trend (unrestricted constant)**			
	Fisher Stat.*	**Prob.**	**Fisher Stat.****	**Prob.**	**Fisher Stat.***	**Prob.**	**Fisher Stat.****	**Prob.**
None	170.0	0.0000	151.2	0.0000	147.8	0.0000	153.6	0.0000
At most 1	103.0	0.0001	103.0	0.0001	31.16	0.9971	31.16	0.9971

Note: Fisher statistical probabilities are computed using asymptotic Chi-square distribution. * from trace test. ** from max-eigenvalue test.
Source: Authors' calculations.

The following *Table 4* presents the panel cointegration results from FMOLS, DOLS and PMG/ARDL estimation methods between the real GDP and ESI measure, testing the long-run linear cointegration relations. Results indicate that the long-run coefficients obtained from all estimation methods are positive and strongly significant varying from 0.13 to 0.26 in the case for constant with trend for FMOLS and DOLS and 7.41 from the PMG/ARDL unrestricted constant case estimation (cases with constant revealed some odd results with negative and or statistically insignificant coefficients, except for the PMG/ARDL test). Accordingly, it can be concluded that the ESI measure tend to have a positive long-term influence on the real GDP in the EU28 countries. The short-run results available from the PMG/ARDL model are consistent with the long-run results. Namely, the error correction coefficients in the case of PMG/ARDL are statistically significant and have a correct negative sign, which suggests a moderate speed of convergence to the long-run equilibrium.

Table 8 in the *Appendix* displays individual short-run cross section results obtained from the PMG/ARDL model estimation. Short-run evidence suggests rather mixed results regarding the signs of the coefficients, however, error correction coefficients are statistically significant and negative across the whole panel suggesting a slow to moderate speed of convergence. Again, we can confirm the homogeneity of the sample.

Table 4: Panel cointegration results (Pooled estimation) – lnGDP, lnESI

Panel Fully Modified Least Squares (FMOLS)								
Variable	**Constant**				**Constant and trend**			
	Coefficient	*Std. Error*	*t-Statistic*	*Prob.*	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
lnESI	-0.023492	0.097082	-0.241979	0.8089	0.129725	0.039100	3.317741	0.0010
Panel Dynamic Least Squares (DOLS)								
Variable	Constant				Constant and trend			
	Coefficient	*Std. Error*	*t-Statistic*	*Prob.*	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
lnESI	0.017989	0.145259	0.123838	0.9015	0.263230	0.048908	5.382106	0.0000
*PMG/ARDL (Pooled Mean Group/AR Distributed Lag)**								
Variable	*Restricted constant*				*Unrestricted constant*			
	Coefficient	*Std. Error*	*t-Statistic*	*Prob.*	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
	Long Run Equation							
lnESI	9.894215	1.626915	6.081580	0.0000	7.410409	1.849891	4.005863	0.0001
	Short Run Equation							
COINTEQ01	-0.027799	0.002465	-11.27898	0.0000	-0.038282	0.003498	-10.94476	0.0000
D(lnESI)	0.021989	0.010105	2.176042	0.0301	0.015630	0.010907	1.433087	0.1527
C	-0.533554	0.054514	-9.787434	0.0000	-0.305702	0.038664	-7.906527	0.0000
@TREND					0.000301	0.000238	1.264690	0.2068

Note: * Selected model: ARDL (1,1).
Source: Authors' calculations.

Zero restrictions on the long-run parameters are tested using the Wald test. It is clearly visible from *Table 5* that the null hypothesis can be strongly rejected (especially for the case with constant and trend i.e. unrestricted constant) confirming once again that the ESI measure does affect the real GDP in the long-run.

Table 5: Long-run Wald test coefficient restrictions (lnESI=0)

Panel Fully Modified Least Squares (FMOLS)						
Test Statistic	**Constant**			**Constant and trend**		
	Value	*df*	*Prob.*	*Value*	*df*	*Prob.*
t-statistic	-0.241979	436	0.8089	3.317741	408	0.0010
F-statistic	0.058554	(1, 436)	0.8089	11.00741	(1, 408)	0.0010
Chi-square	0.058554	1	0.8088	11.00741	1	0.0009
Panel Dynamic Least Squares (DOLS)						
Test Statistic	*Constant*			*Constant and trend*		
	Value	*df*	*Prob.*	*Value*	*df*	*Prob.*
t-statistic	0.123838	324	0.9015	4.352799	389	0.0000
F-statistic	0.015336	(1, 324)	0.9015	18.94686	(1, 389)	0.0000
Chi-square	0.015336	1	0.9014	18.94686	1	0.0000
PMG/ARDL (Pooled Mean Group/AR Distributed Lag)						
Test Statistic	*Restricted constant*			*Unrestricted constant*		
	Value	*df*	*Prob.*	*Value*	*df*	*Prob.*
t-statistic	6.081580	408	0.0000	4.005863	380	0.0001
F-statistic	36.98562	(1, 408)	0.0000	16.04694	(1, 380)	0.0001
Chi-square	36.98562	1	0.0000	16.04694	1	0.0001

Source: Authors' calculations.

Although ESI captures only partial information on economic confidence (perspective and state of mind), it has a significant advantage over GDP statistics in terms of availability i.e. it is becoming a timely information about the processes occurring in the economy that precedes quarterly information of the GDP. Our study found that short-term changes of the ESI measure can be considered as statistically significant indicator of the EU real GDP in the short-run, hence this survey indicator can be used in the short-term GDP forecast models. On the other hand, study also revealed the existing long-run relationship between the observed variables. Namely that ESI measure has a positive long-term influence on the real GDP in all EU countries. It means that positive judgements and opinions of public and businesses shall be positively reflected in the future long-term developments of the European economy. Most of the EU countries used ESI to forecast short-term GDP, yet the results of this study clearly suggest that this survey indicator with 'soft data' should be also complementing conventional long-run forecasting models of economic activity in the EU. Although ESI measure is not a crucial determinant of economic activity in the EU, it still can help in explaining and leveraging some specific economic developments.

Concluding remarks

This study has proposed an empirical assessment of the link between the ESI measure and the real GDP within the EU28 countries. Although not providing any methodological novelty to the empirical literature, the value of this paper can be found in the universality of the sample and its grasp on the long-run bond. Overall, the results have shown that the ESI can provide some valuable information on the development of the real GDP for almost all EU 28 countries, both in the short- and long-run, increasing its usefulness as an indicator that reflects general economic activity when no information on the GDP is available for certain period. The main advantage of this study is that the modelling was carried out for all EU countries, whereas its main limitation is that it only reveals the nature of the relationship between the variables and not directly confirming the predicting quality of the ESI. Comprehending the nature of this relationship, the real question that arises many dilemmas is can EU undertake timely (and adequate) counter- or pro-cyclical measure before economic turning-points.

NOTES

[1] EViews (IHS Global Inc., 2015) econometric software was used for the whole methodological part.
[2] GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 U.S. dollars. Dollar figures for GDP are converted from domestic currencies using 2010 official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used.
[3] This indicator is a composite measure of five confidence indicators presented as average = 100. Data were aggregated on annual level form monthly indicators.

REFERENCES

Biau, O. and D'Elia, A. (2010). Euro area GDP forecast using large survey datasets. A random forest approach, presented at the 30th Ciret Conference, New York.

Breitung, J. (2000). The Local Power of Some Unit Root Tests for Panel Data. In B. Baltagi (ed.), Advances in Econometrics, Vol. 15: Nonstationary Panels, Panel Cointegration, and Dynamic Panels, Elsevier Science Inc., pp. 161-178.

Breitung, J. and Hashem Pesaran, M. (2005). Unit Roots and Cointegration in Panels. CESIFO Working Paper No. 1565, CESifo Group Munich.

Choi, I. (2001). Unit Root Tests for Panel Data. Journal of International Money and Finance, Vol. 20, No. 2, pp. 249-272.

Di lorio, F. and Fachin, S. (2011). A Panel Cointegration study of the long-run relationship between Savings and Investments in the OECD economies, 1970-2007. Working Paper No. 3, Department of Treasury of the Italian Ministry of Economy and Finance.

European Commission (2010). [online]. Available at: https://bit.ly/2zbdHox ECB (2017). [online]. Available at: https://bit.ly/1EZMotB

Fisher, R. A. (1932). Statistical Methods for Research Workers, 4th Edition. Oliver & Boyd: Edinburgh.

Gayer, C. (2005). Forecast Evaluation of European Commission Survey Indicators. Journal of Business Cycle Measurement and Analysis, Vol. 2, No. 2, pp. 157-183.

Gelper, S. and Croux, C. (2010). On the construction of the European Economic Sentiment Indicator. Oxford Bulletin of Economics and Statistics. Vol. 72, No. 1,pp. 47-62. DOI: https://doi.org/10.1111/j.1468-0084.2009.00574.x.

Hadri, K. (2000). Testing for Stationarity in Heterogeneous Panel Data. Econometrics Journal, Vol. 3, No. 2, pp. 148-161. DOI: https://doi.org/10.1111/1368-423X.00043.

Haluška, J. (2006). The use of business survey results for GDP flash estimates. NBS Biatec, Vol. 14, No. 4, pp. 2-6.

Johansen, S. (1991). Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. Econometrica, Vol. 59, No. 6, pp. 1551-1580.

Johansen, S. (1995). Likelihood-based Inference in Cointegrated Vector Autoregressive Models. Oxford: Oxford University Press.

Kao, C. and Chiang, M-H. (2000). On the Estimation and Inference of a Cointegrated Regression in Panel Data. In B. Baltagi (ed.), Advances in Econometrics, Vol. 15: Nonstationary Panels, Panel Cointegration, and Dynamic Panels, Elsevier Science Inc., pp. 179-222.

Levin, A., Lin, C. and Chu, C. (2002). Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. Journal of Econometrics, Vol. 108, No. 1, pp. 1-24.

Maddala, G. S. and Wu, S. (1999). A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test. Oxford Bulletin of Economics and Statistics, Vol. 61, No. S1, pp. 631-652.

Mark, C., N. and Sul, D. (1999). A Computationally Simple Cointegration Vector Estimator for Panel Data, Ohio State University manuscript.

Mark, C. N. and Sul, D. (2003). Cointegration Vector Estimation by Panel DOLS and Long-run Money Demand. Oxford bulletin of economics and statistics, Vol. 65, No. 5, pp. 655-680. DOI: https://doi.org/10.1111/j.1468-0084.2003.00066.x.

Pedroni, P. (1999). Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors. Oxford Bulletin of Economics and Statistics, Vol. 61, Special Issue, pp. 653-70. DOI: https://doi.org/10.1111/1468-0084.0610s1653.

Pedroni, P. (2000). Fully Modified OLS for Heterogeneous Cointegrated Panels In B. Baltagi (ed.), Advances in Econometrics, Vol. 15: Nonstationary Panels, Panel Cointegration, and Dynamic Panels, Elsevier Science Inc., pp. 93-130. DOI: https://doi.org/10.1016/S0731-9053(00)15004-2.

Pedroni, P. (2001). Purchasing Power Parity Tests in Cointegrated Panels. The Review of Economics and Statistics, Vol. 83, No. 4, pp. 727-731.

Pedroni, P. (2004). Panel Cointegration; Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis. Econometric Theory, Vol. 20, No. 3, pp. 597-625. DOI: https://doi.org/10.1017/S0266466604203073.

Pesaran, M. H., Shin, Y. and Smith, R. P. (1999). Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. Journal of the American Statistical Association, Vol. 94, No. 446, pp. 621-634.

Phillips, P. C. B. and Hansen, B. E. (1990). Statistical Inference in Instrumental Variables Regression with I(1) Processes. Review of Economics Studies, Vol. 57, No. 1, pp. 99-125.

Phillips, P. C. B. and Moon, H. R. (1999). Linear Regression Limit Theory for Nonstationary Panel Data. Econometrica, Vol. 67, No. 5, pp. 1057-1111.

Saikkonen, P. (1992). Estimation and Testing of Cointegrated Systems by an Autoregressive Approximation. Econometric Theory, Vol. 8, No. 1, pp. 1-27.

Silgoner, M.A. (2007). The Economic Sentiment Indicator: Leading Indicator – Properties in Old and New EU Member States. Journal of Business Cycle Measurement and Analysis, Vol. 3, No. 2, pp. 199-215. DOI: https://doi.org/10.1787/jbcma-v2007-art11-en.

Sorić, Lolić and Čižmešija M. (2015). European economic sentiment indicator: An empirical reappraisal. EFZG working paper series, No. 5, pp. 1-22.

Sorić, Lolić and Čižmešija, M. (2013). European Integration in the Light of Business and Consumer Surveys. Eastern European Economics, Vol. 51, No. 2, pp. 5-21. DOI: https://doi.org/10.2753/EEE0012-8775510201.

Stock, J. H. and Watson, M. (1993). A Simple Estimator Of Cointegrating Vectors In Higher Order Integrated Systems. Econometrica, Vol. 61, No. 4, pp. 783-820.

Stock, J. and Watson, M. (2002). Forecasting using principal components from a large number of predictors. Journal of the American Statistical Association, Vol. 97, No. 460, pp. 1167-1179. DOI: https://doi.org/10.1198/016214502388618960.

Škare, M., Benazić, M. and Tomić, D. (2016). On the neutrality of money in CEE (EU member) states: A panel cointegration analysis. Acta Oeconomica, Vol. 66, No. 3, pp. 393-418. DOI: https://doi.org/10.1556/032.2016.66.3.2.

Appendix

Table 6: Panel unit root tests

Variable and test	Level		First difference	
	Intercept	**Intercept and trend**	**Intercept**	**Intercept and trend**
*Levin, Lin and Chu t**	*Prob.***			
lnGDP	0.0032	0.0006	0.0000	0.0000
lnESI	0.3544	1.0000	0.0000	0.0000
Breitung t-stat	*Prob.***			
lnGDP	-	0.0001	-	0.0000
lnESI	-	0.5743	-	0.0000
Im, Pesaran and Shin W-stat	*Prob.***			
lnGDP	0.9477	0.3846	0.0000	0.0084
lnESI	0.0000	0.9688	0.0000	0.0000
ADF – Fisher Chi-square	*Prob.***			
lnGDP	0.9706	0.6458	0.0000	0.0202
lnESI	0.0000	0.9999	0.0000	0.0000
PP – Fisher Chi-square	*Prob.***			
lnGDP	0.9534	1.0000	0.0000	0.0000
lnESI	0.0000	0.0061	0.0000	0.0000

Notes: * Heteroscedastic Consistent. ** Probabilities are computed assuming asymptotic normality. *** Probabilities are computed using an asymptotic Chi-square distribution.
Source: Author's calculations.

Table 7: Johansen Fisher panel cointegration test – Individual cross section results – lnGDP, lnESI

Cross Section	No deterministic trend (restricted constant)				Linear deterministic trend			
	Trace Test Statistics	Prob.*	Max-Eign Test Statistics	Prob.*	Trace Test Statistics	Prob.*	Max-Eign Test Statistics	Prob.*
Hypothesis of no cointegration								
Belgium	21.6721	0.0052	18.4570	0.0103	22.9071	0.1120	18.4822	0.0673
Bulgaria	25.3668	0.0012	21.1050	0.0036	28.0898	0.0261	21.3015	0.0261
Czech Rep.	11.3082	0.1932	9.7984	0.2255	20.4015	0.2063	16.0164	0.1445
Denmark	7.2272	0.5514	7.0206	0.4867	22.4905	0.1246	18.9984	0.0569
Germany	21.2012	0.0062	20.5828	0.0044	28.4392	0.0234	23.7211	0.0110
Estonia	17.3749	0.0258	15.2972	0.0342	22.4272	0.1266	17.0313	0.1065
Ireland	13.4061	0.1007	13.3930	0.0683	17.6311	0.3692	13.6589	0.2778
Greece	26.5050	0.0008	21.2601	0.0034	30.6082	0.0119	22.9137	0.0147
Spain	8.1283	0.4518	7.8509	0.3940	21.4746	0.1602	16.3931	0.1292
France	9.0613	0.3597	7.9220	0.3867	13.2786	0.7162	9.4492	0.6776
Croatia	11.5326	0.1808	11.2519	0.1420	59.3752	0.0000	50.5690	0.0000
Italy	11.9545	0.1591	8.7740	0.3054	14.7050	0.5991	11.0921	0.5039
Cyprus	8.9639	0.3687	6.7459	0.5196	12.2979	0.7910	6.8612	0.9100
Latvia	24.0279	0.0021	18.7998	0.0089	31.0114	0.0105	25.3624	0.0060
Lithuania	15.6631	0.0472	12.3030	0.0998	19.7371	0.2395	13.8386	0.2651
Luxembourg	6.6535	0.6182	5.2071	0.7155	11.6250	0.8371	7.9660	0.8245
Hungary	8.8611	0.3784	8.7385	0.3086	14.5652	0.6107	9.3490	0.6881
Malta	12.1219	0.1512	10.3236	0.1915	20.5185	0.2008	16.1865	0.1374
Netherlands	15.5840	0.0485	14.9148	0.0394	18.7188	0.2977	15.5495	0.1656
Austria	25.0583	0.0014	23.7195	0.0012	27.6447	0.0298	23.7237	0.0110
Poland	21.9805	0.0046	20.8655	0.0039	25.7009	0.0525	22.0402	0.0201
Portugal	16.4663	0.0356	13.2582	0.0716	21.0939	0.1755	17.2867	0.0984
Romania	17.9738	0.0207	15.0076	0.0381	23.5574	0.0945	15.0205	0.1925
Slovenia	16.9068	0.0305	13.7473	0.0602	19.1961	0.2693	13.7691	0.2700
Slovak Rep.	11.6146	0.1764	8.7140	0.3107	27.3416	0.0326	22.6507	0.0162
Finland	13.6504	0.0930	9.0729	0.2801	25.4441	0.0564	20.8396	0.0306
Sweden	9.5637	0.3158	7.7221	0.4077	20.8517	0.1858	15.4721	0.1693
UK	14.3911	0.0728	13.1320	0.0749	19.6571	0.2438	14.8388	0.2025
Hypothesis of at most 1 cointegration relationship								
Belgium	3.2151	0.0730	3.2151	0.0730	4.4250	0.6801	4.4250	0.6801
Bulgaria	4.2618	0.0390	4.2618	0.0390	6.7883	0.3671	6.7883	0.3671
Czech Rep.	1.5098	0.2192	1.5098	0.2192	4.3851	0.6859	4.3851	0.6859
Denmark	0.2066	0.6495	0.2066	0.6495	3.4921	0.8136	3.4921	0.8136
Germany	0.6184	0.4316	0.6184	0.4316	4.7181	0.6372	4.7181	0.6372
Estonia	2.0777	0.1495	2.0777	0.1495	5.3959	0.5405	5.3959	0.5405
Ireland	0.0131	0.9086	0.0131	0.9086	3.9722	0.7461	3.9722	0.7461
Greece	5.2449	0.0220	5.2449	0.0220	7.6945	0.2776	7.6945	0.2776

Spain	0.2774	0.5984	0.2774	0.5984	5.0816	0.5847	5.0816	0.5847
France	1.1394	0.2858	1.1394	0.2858	3.8294	0.7667	3.8294	0.7667
Croatia	0.2807	0.5962	0.2807	0.5962	8.8062	0.1926	8.8062	0.1926
Italy	3.1805	0.0745	3.1805	0.0745	3.6129	0.7971	3.6129	0.7971
Cyprus	2.2181	0.1364	2.2181	0.1364	5.4367	0.5349	5.4367	0.5349
Latvia	5.2281	0.0222	5.2281	0.0222	5.6490	0.5061	5.6490	0.5061
Lithuania	3.3600	0.0668	3.3600	0.0668	5.8985	0.4733	5.8985	0.4733
Luxembourg	1.4464	0.2291	1.4464	0.2291	3.6590	0.7907	3.6590	0.7907
Hungary	0.1226	0.7262	0.1226	0.7262	5.2162	0.5657	5.2162	0.5657
Malta	1.7983	0.1799	1.7983	0.1799	4.3319	0.6937	4.3319	0.6937
Netherlands	0.6692	0.4133	0.6692	0.4133	3.1693	0.8558	3.1693	0.8558
Austria	1.3387	0.2473	1.3387	0.2473	3.9210	0.7535	3.9210	0.7535
Poland	1.1151	0.2910	1.1151	0.2910	3.6607	0.7905	3.6607	0.7905
Portugal	3.2082	0.0733	3.2082	0.0733	3.8072	0.7698	3.8072	0.7698
Romania	2.9662	0.0850	2.9662	0.0850	8.5369	0.2109	8.5369	0.2109
Slovenia	3.1595	0.0755	3.1595	0.0755	5.4270	0.5362	5.4270	0.5362
Slovak Rep.	2.9006	0.0885	2.9006	0.0885	4.6909	0.6412	4.6909	0.6412
Finland	4.5775	0.0324	4.5775	0.0324	4.6045	0.6538	4.6045	0.6538
Sweden	1.8416	0.1748	1.8416	0.1748	5.3796	0.5428	5.3796	0.5428
UK	1.2591	0.2618	1.2591	0.2618	4.8183	0.6226	4.8183	0.6226

Note: Lags interval (in first differences): 1. * MacKinnon-Haug-Michelis (1999) p-values.
Source: Author's calculations.

Table 8: Cross-section short run PMG/ARDL coefficients – lnGDP, lnESI

Variable	***Restricted constant***				***Unrestricted constant***			
	Coefficient	*Std. Error*	*t-Statistic*	*Prob.*	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
Belgium								
COINTEQ01	-0.013980	1.01E-05	-1389.704	0.0000	-0.017887	2.80E-05	-639.7730	0.0000
D(lnESI)	0.023389	0.000262	89.15483	0.0000	0.028664	0.000245	116.9680	0.0000
C	-0.246778	0.005677	-43.46978	0.0000	-0.111992	0.014720	-7.608185	0.0047
@TREND					-0.000355	8.09E-08	-4389.163	0.0000
Bulgaria								
COINTEQ01	-0.028446	2.60E-05	-1095.463	0.0000	-0.036385	0.000103	-352.4267	0.0000
D(lnESI)	0.098711	0.001203	82.04051	0.0000	0.098886	0.001256	78.70341	0.0000
C	-0.568635	0.019396	-29.31701	0.0001	-0.318390	0.050180	-6.344969	0.0079
@TREND					-7.35E-05	3.58E-07	-205.3363	0.0000
Czech Rep.								
COINTEQ01	-0.024488	2.72E-05	-901.5138	0.0000	-0.037195	0.000114	-325.5745	0.0000
D(LNESI)	0.067716	0.001896	35.71157	0.0000	0.038880	0.001945	19.98553	0.0003
C	-0.455946	0.017654	-25.82619	0.0001	-0.291580	0.059815	-4.874708	0.0165
@TREND					0.001325	5.43E-07	2438.940	0.0000
Denmark								
COINTEQ01	-0.019632	3.15E-05	-623.7028	0.0000	-0.030834	9.32E-05	-330.8498	0.0000
D(LNESI)	0.010495	0.001257	-8.349504	0.0036	-0.034821	0.001060	-32.86570	0.0001
C	-0.364601	0.015340	-23.76812	0.0002	-0.236979	0.043214	-5.483823	0.0119
@TREND					0.001258	2.80E-07	4488.942	0.0000
Germany								
COINTEQ01	-0.019079	2.69E-05	-710.1188	0.0000	-0.039041	0.000111	-352.9959	0.0000
D(LNESI)	0.043872	0.001189	36.90479	0.0000	0.017093	0.000451	37.86366	0.0000
C	-0.304146	0.012107	-25.12116	0.0001	-0.169843	0.078898	-2.152682	0.1204
@TREND					-0.002244	1.93E-07	-11639.34	0.0000
Estonia								
COINTEQ01	-0.054758	9.10E-05	-601.9622	0.0000	-0.083453	0.000453	-184.4263	0.0000
D(LNESI)	0.013946	0.002395	5.822594	0.0101	-0.040318	0.001478	-27.27740	0.0001
C	-1.172706	0.063844	-18.36822	0.0004	-0.876288	0.244708	-3.580951	0.0373
@TREND					0.003340	8.19E-07	4080.308	0.0000
Ireland								
COINTEQ01	-0.046789	0.000161	-290.0466	0.0000	-0.063064	0.000428	-147.5011	0.0000
D(LNESI)	0.000515	0.009217	0.055907	0.9589	-0.022393	0.009480	-2.362073	0.0992
C	-0.847790	0.076019	-11.15232	0.0015	-0.458117	0.174429	-2.626379	0.0786
@TREND					0.001731	3.44E-06	503.6278	0.0000
Greece								
COINTEQ01	-0.040936	5.65E-05	-725.0602	0.0000	-0.055793	0.000202	-275.9473	0.0000
D(LNESI)	-0.040936	0.002219	-23.00444	0.0002	-0.066841	0.002883	-23.18851	0.0002
C	-0.769736	0.036100	-21.32230	0.0002	-0.419509	0.144094	-2.911352	0.0619
@TREND					0.000319	9.64E-07	330.8862	0.0000
Spain								
COINTEQ01	-0.024562	2.00E-05	-1229.641	0.0000	-0.032124	7.01E-05	-458.1007	0.0000
D(LNESI)	-0.076119	0.001149	-66.23675	0.0000	-0.074351	0.001509	-49.26078	0.0000
C	-0.414055	0.015209	-27.22393	0.0001	-0.179914	0.051369	-3.502399	0.0394
@TREND					3.35E-07	2.78E-07	1.203855	0.3150

France								
COINTEQ01	-0.011444	6.24E-06	-1832.436	0.0000	-0.016525	2.47E-05	-668.7517	0.0000
D(LNESI)	0.042885	0.000243	176.3309	0.0000	0.035071	0.000327	107.2036	0.0000
C	-0.180885	0.003888	-46.52474	0.0000	-0.080715	0.014096	-5.726017	0.0106
@TREND					0.000295	1.10E-07	2673.426	0.0000
Croatia								
COINTEQ01	-0.023156	1.87E-05	-1238.429	0.0000	-0.028180	0.000205	-137.7571	0.0000
D(LNESI)	0.140804	0.000683	206.2161	0.0000	0.142677	0.001072	133.1197	0.0000
C	-0.476964	0.010753	-44.35831	0.0000	-0.269220	0.034243	-7.861987	0.0043
@TREND					0.000734	1.03E-05	71.49101	0.0000
Italy								
COINTEQ01	-0.019904	1.88E-05	-1056.503	0.0000	-0.026553	6.05E-05	-438.7468	0.0000
D(LNESI)	0.032815	0.000709	46.30257	0.0000	0.032260	0.000876	36.82853	0.0000
C	-0.337753	0.011021	-30.64603	0.0001	-0.148062	0.036149	-4.095905	0.0263
@TREND					-2.13E-05	2.28E-07	-93.41493	0.0000
Cyprus								
COINTEQ01	-0.030425	3.25E-05	-934.9679	0.0000	-0.039698	0.000117	-338.9778	0.0000
D(LNESI)	-0.047748	0.002044	-934.9679	0.0002	-0.045072	0.002853	-15.79637	0.0006
C	-0.637064	0.020403	-31.22386	0.0001	-0.383756	0.059750	-6.422726	0.0076
@TREND					-4.30E-05	6.85E-07	-62.70021	0.0000
Latvia								
COINTEQ01	-0.060621	9.70E-05	-624.9215	0.0000	-0.081872	0.000418	-195.7662	0.0000
D(LNESI)	-0.044964	0.001595	-28.19574	0.0001	-0.061808	0.001844	-33.51606	0.0001
C	-1.290609	0.073127	-17.64877	0.0004	-0.824644	0.245475	-3.359383	0.0438
@TREND					0.001145	9.27E-07	1234.798	0.0000
Lithuania								
COINTEQ01	-0.048724	7.55E-05	-645.0010	0.0000	-0.062924	0.000283	-222.5066	0.0000
D(LNESI)	0.063494	0.001691	37.54771	0.0000	0.064484	0.001647	39.14154	0.0000
C	-1.005069	0.051108	-19.66567	0.0003	-0.583373	0.145383	-4.012675	0.0278
@TREND					-0.000365	-8.94E 07	-407.9737	0.0000
Luxembourg								
COINTEQ01	-0.010475	5.39E-05	-194.3361	0.0000	-0.008652	0.000130	-66.50047	0.0000
D(LNESI)	0.128106	0.004187	30.59503	0.0001	0.165872	0.005839	28.40925	0.0001
C	-0.190110	0.024020	-7.914671	0.0042	-0.044179	0.015112	-2.923433	0.0613
@TREND					-0.001094	1.70E-06	-643.8108	0.0000
Hungary								
COINTEQ01	-0.030642	4.77E-05	-642.3546	0.0000	-0.041180	0.000125	-330.6119	0.0000
D(LNESI)	0.021708	0.002754	-7.882413	0.0043	0.000431	0.001763	0.244620	0.8225
C	-0.593346	0.026415	-22.46216	0.0002	-0.317908	0.071767	-4.429739	0.0214
@TREND					-0.001663	3.36E-07	-4948.032	0.0000
Malta								
COINTEQ01	-0.035012	0.000113	-309.6246	0.0000	-0.038890	0.000214	-181.6915	0.0000
D(LNESI)	-0.022646	0.003855	-5.874407	0.0098	-0.012826	0.002867	-4.473645	0.0208
C	-0.753688	0.048264	-15.61602	0.0006	-0.421037	0.057639	-7.304707	0.0053
@TREND					0.002363	8.04E-07	2940.577	0.0000

Netherlands								
COINTEQ01	-0.014515	8.00E-06	-1814.490	0.0000	-0.019247	2.66E-05	-724.0803	0.0000
D(LNESI)	0.032714	0.000154	212.3231	0.0000	0.036436	0.000134	272.2046	0.0000
C	-0.246233	0.005047	-48.78934	0.0000	-0.108513	0.017377	-6.244808	0.0083
@TREND					-0.000373	5.82E-08	-6415.188	0.0000
Austria								
COINTEQ01	-0.021495	1.85E-05	-1163.212	0.0000	-0.028087	5.87E-05	-478.7242	0.0000
D(LNESI)	-0.031468	0.000375	-83.80347	0.0000	-0.024788	0.000354	-69.93583	0.0000
C	-0.389146	0.011400	-34.13551	0.0001	-0.189213	0.035352	-5.352255	0.0128
@TREND					-0.000359	1.04E-07	-3452.606	0.0000
Poland								
COINTEQ01	-0.015013	1.41E-05	-1066.374	0.0000	-0.020305	4.09E-05	-496.4767	0.0000
D(LNESI)	0.007958	0.000677	11.75094	0.0013	0.005449	0.000688	7.919784	0.0042
C	-0.240081	0.007383	-32.51784	0.0001	-0.110160	0.018729	-5.881897	0.0098
@TREND					0.000348	2.10E-07	1662.561	0.0000
Portugal								
COINTEQ01	-0.018175	1.07E-05	-1704.065	0.0000	-0.023680	3.71E-05	-638.2250	0.0000
D(LNESI)	0.033917	0.000185	183.4722	0.0000	0.043078	0.000160	268.8278	0.0000
C	-0.341325	0.006819	-50.05716	0.0000	-0.173098	0.024133	-7.172651	0.0056
@TREND					-0.000477	4.32E-08	-11050.46	0.0000
Romania								
COINTEQ01	-0.030669	2.87E-05	-1069.471	0.0000	-0.049372	0.000175	-282.3853	0.0000
D(LNESI)	0.021434	0.000526	40.73539	0.0000	0.046982	0.002105	22.32233	0.0002
C	-0.622270	0.018875	-32.96790	0.0001	-0.397263	0.101701	-3.906182	0.0298
@TREND					0.002530	7.09E-07	3566.666	0.0000
Slovenia								
COINTEQ01	-0.026942	2.67E-05	-1009.396	0.0000	-0.040356	0.000110	-367.3121	0.0000
D(LNESI)	0.017198	0.001171	14.68213	0.0007	0.022382	0.000614	36.44958	0.0000
C	-0.513868	0.020356	-25.24441	0.0001	-0.364424	0.062160	-5.862701	0.0099
@TREND					1.25E-05	2.44E-07	51.13816	0.0000
Slovak Rep.								
COINTEQ01	-0.036682	6.21E-05	-591.0805	0.0000	-0.039571	0.000122	-325.1585	0.0000
D(LNESI)	-0.009320	0.001985	-4.694971	0.0183	0.000413	0.001253	0.329420	0.7635
C	-0.697119	0.037198	-18.74054	0.0003	-0.332052	0.063829	-5.202166	0.0138
@TREND					0.001373	7.47E-07	1836.917	0.0000
Finland								
COINTEQ01	-0.026600	5.99E-05	-444.1384	0.0000	-0.051822	0.000236	-219.5791	0.0000
D(LNESI)	0.058824	0.001929	30.50074	0.0001	-0.027444	0.002489	-11.02448	0.0016
C	-0.480821	0.026646	-18.04449	0.0004	-0.402727	0.118058	-3.411278	0.0421
@TREND					0.000591	6.46E-07	915.5493	0.0000
Sweden								
COINTEQ01	-0.014618	1.49E-05	-980.0250	0.0000	-0.039551	0.000151	-261.5948	0.0000
D(LNESI)	0.007355	0.000740	9.933545	0.0022	0.057320	0.001367	41.92795	0.0000
C	-0.231562	0.007332	-31.58279	0.0001	-0.260360	0.071571	-3.637770	0.0358
@TREND					-0.001175	3.05E-07	-3846.428	0.0000
UK								
COINTEQ01	-0.030578	3.53E-05	-866.8046	0.0000	-0.019644	3.79E-05	-518.4713	0.0000
D(LNESI)	0.095538	0.002758	34.63584	0.0001	0.011933	0.000638	18.69447	0.0003
C	-0.567193	0.025935	-21.86996	0.0002	-0.086324	0.019815	-4.356615	0.0223
@TREND					-0.000686	2.03E-07	-3381.486	0.0000

Source: Author's calculation