










# “Net investment position and the stock market: The case of traditional and ESG indices”

<b>AUTHORS</b>	Jaroslav Slepecký Anna Vorontsova   Alex Plastun   Inna Makarenko   Iryna Zhyhlei  
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© Jaroslav Slepecký, Anna Vorontsova,  
Alex Plastun, Inna Makarenko, Iryna  
Zhyhlei, 2022

Jaroslav Slepecký, Ph.D., Ing., Associate  
Professor, Ambis University, Institute of  
Security Management, Czech Republic.

Anna Vorontsova, Ph.D. in Economics,  
Senior Lecturer, Department of the  
International Economic Relations,  
Sumy State University, Ukraine.

Alex Plastun, Doctor of Economics,  
Professor, Department of the  
International Economic Relations,  
Sumy State University, Ukraine.

Inna Makarenko, Doctor of Economics,  
Professor, Department of the  
Accounting and Taxation, Sumy State  
University, Ukraine. (Corresponding  
author)

Iryna Zhyhlei, Doctor of Economics,  
Professor, Department of information  
systems in management and  
accounting, Zhytomyr Polytechnic State  
University, Ukraine.



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Jaroslav Slepecký (Czech Republic), Anna Vorontsova (Ukraine),  
Alex Plastun (Ukraine), Inna Makarenko (Ukraine), Iryna Zhyhlei (Ukraine)

# NET INVESTMENT POSITION AND THE STOCK MARKET: THE CASE OF TRADITIONAL AND ESG INDICES

## Abstract

This paper explores the influence of traditional and ESG stock market indices on a country's net international investment position. To do this, different methods, including ANOVA analysis, multiply regression analysis, correlation analysis, VAR-analysis and R/S-analysis, as well as the Granger causality test, are applied to quarterly data on the net international investment position, traditional and ESG indices from Finland, Sweden, France, Spain and Ukraine over the period 2005–2021. The results of descriptive statistics show that ESG indices are more volatile than traditional, but these differences are statistically insignificant according to ANOVA analysis. Correlation analysis provides direct evidence that ESG indices are highly correlated with their traditional analogues (correlation level varies from 0.88 to 0.96). Regression analysis results show that traditional and ESG stock market indices have no significant impact on the net international investment position. ESG stock market indices and net international investment position data are persistent, and autoregressive models can be applied to these data sets. On average, Hurst exponent is above 0.75 for the case of ESG indices and above 0.85 for the net investment position. This paper provides recommendations to improve the responsible investment framework.

## Keywords

ESG investment, responsible investment, stock market index, traditional investment

## JEL Classification

F21, G11, O16, E44

## INTRODUCTION

The COVID-19 pandemic has reduced total global investment flows by \$0.6 trillion annually and foreign direct investment by 40% (UNCTAD, 2020). Countries with an unstable investment position and unfavorable investment climate suffer significant losses. For example, in Ukraine, capital investment declined by 40% during the pandemic. Overall, since 2007 in Ukraine the net growth of foreign direct investment has been less than the normative value (7% of GDP).

In these conditions, developed countries are trying to compensate the deterioration of their investment position by shifting from traditional to socially responsible investment (ESG).

In particular, in the EU in the next decade as a part of EU Green Deal, it is planned to accumulate around €1 trillion from the EU budget and related mechanisms for the circular economy support, infrastructure upgrading, biodiversity, small and medium-sized enterprises, agriculture and innovation (EESC, 2019).

This investment support is primarily aimed at investing in "green" post-pandemic recovery and has the responsible investment (RI) or-

igin. It aims to improve the net international investment position of EU countries through multiplier effects and intensify the transition to sustainability and achievement of SDGs.

A possible way to solve the current problems in countries like Ukraine is the use of the relevant experience from developed European countries for creating a basis for RI attraction. It can help to improve the net international investment position and accelerate sustainable development by intensifying RI and benchmarks in the stock market.

The ESG investment dynamics in a country can be illustrated by key indices of sustainable development (ESG indices), which has been accelerated recently with the intensification of responsible investing. However, responsible investment is not widely used by countries. As a result, it is hard to estimate the influence of ESG indices on investment processes.

Stock markets are major influencers on the investment climate and the country's position in capital markets (Baumohl, 2012; Thalassinou et al., 2015). Still, the relationship between the net international investment position and stock market indices is not explored yet in the academic literature.

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## 1. LITERATURE REVIEW

International investment position is a statistical report that introduces the value and structure of a country's external financial assets and liabilities at a certain period (Ukrstat, 2020) and illustrates the balance of investment flows. It covers categories such as a direct investment: equity and debt instruments; portfolio investments: equity instruments; debt securities; financial derivatives; other investments: other equity instruments, currency and deposits, loans, trade credits and advance repayments; reserve assets.

Given the number of components, the investment position is a rather complex concept. Under its complexity, based on the basis of bibliometric analysis, this study proposes to carry out a review of previous research papers in the field of the impact of stock indices on the net international position. They take into account modern algorithms for finding sources by exact parameters and keywords from the largest scientometric databases. The combination of these methods (In-built Scopus instruments by Elsevier, In-built Web of Science instruments by Clarivate Analytics, Publish or Perish software) is used to select and summarize the academic background related to a country's net investment position and the impact of traditional and ESG stock market indices:

- In-built Scopus instruments by Elsevier, In-built Web of Science instruments by Clarivate

Analytics – for selection and initial analysis of publications from Scopus and Web of Science;

- Publish or Perish – for selection and initial analysis of publications from Google Scholar;
- Each search and request within the meta-analysis instruments are formed using a logic operator as of January 25, 2022 for 2000–2021.

The research queries are as follows:

- Net international investment position;
- Net international investment position AND stock indices;
- Net international investment position AND responsible investment.

The generalization of the array of scientific papers on three scientometric bases (a total of 448 papers) indicates the prevalence of scientific papers within the query Net international investment position. The query Net international investment position AND stock indices, as well as the query Net international investment position AND responsible investment are represented by a relatively small number of publications – 10 and 9, respectively.

According to the query results on search terms for 11 years, countries' net investment positions are not considered actively enough. For the most part,

**Table 1.** Static analysis of the net investment position and other queries in academic literature for the period 2000–2021 as of January 25, 2022

Source: Compiled by authors via WoS, Scopus in-built instruments and Publish or Perish.

Searching term	Results found			Sum of the Times Cited			h-index		
	Scopus	PoP	WoS	Scopus	PoP	WoS	Scopus	PoP	WoS
Net international investment position	429	982	336	6175	487519	6714	35	306	39
Net international investment position AND stock indices	10	20	14	59	108	73	3	5	3
Net international investment position AND responsible investment	9	18	4	127	140	28	5	5	3

scientific queries have been actively started since 2010. The largest number of significant publications on this topic is concentrated in the Google Scholar database (by the number of citations, the Hirsch index). However, even in this database, neither the impact of traditional indices nor responsible investment is considerable.

The results of cluster analysis by publication keywords from the WoS and Scopus databases (Figure A1) confirm the conclusion. Within the predominant topic of net investment position (the green cluster), there are no keywords that would link it to stock indices or responsible investments (ESG).

Given the novelty of the topic and the lack of long-term research, the scientific explanation of the RI impact on the net international investment position is not sufficiently available. The generalized representation of interconnections between the authors who study the countries' investment positions shows a small number of such scientists (about 30) during 2000–2021, as well as the lack of significant scientific schools in this area (Figure A2).

Academic papers in this field have a predominantly national context and consider the countries' net international investment position and some influence of stock market indices, in particular:

- Black Sea Economic Cooperation (BSEC) countries (Siskos & Darvidou, 2020);
- The USA (Nguyen & Whitaker, 2018; Jackson, 2013);
- EU: The Czech Republic (Lisicke & Maleček, 2012; Bruna, 2013); Denmark (Vandevyvere, 2012; Italy (Corte V. Della et al., 2018; Estonia (Sörg & Tuusis, 2009; Germany (Beretta, 2012);

- cross-country comparisons (Lane, 2000; Lane & Milesi-Ferretti, 2007; Siemiatkowski, 2017).
- For example, Jackson (2013) provides one of the explanations of dynamics of U.S. net international investment position within the role foreign investors play in the U.S. stock markets and the potential for large outflows of income and services payments. Later Nguyen and Whitaker (2018) investigate the changes in US investment position within foreign stock price decreases that lowered the equity value of portfolio investment and direct investment assets.
- Vandevyvere (2012) stressed that Dutch net international investment position is more sensitive to valuation changes in international capital markets. Corte V. Della et al. (2018) under sensitivity analysis of Italy's net investment position describes the consequences of "global shock" and "domestic shock" on the stock market with a 30 per cent fall in listed equity prices both worldwide and in Italy.
- In the case of cross-country analysis, Lane (2000) and Lane and Milesi-Ferretti (2007) proved that open countries with larger domestic stock markets tend to hold greater quantities of foreign assets and liabilities in net investment positions. Siemiatkowski (2017) investigates the influence of global stock crises on the EU countries' net investment position with breaking 2008 year. But these papers describe the influence of the stock market on countries' net investment position within traditional economic valuables, not stock index fluctuations.

The RI context is mainly not used in the works mentioned above. Only in Bruna's (2013) paper,

**Table 2.** Academic papers on the net investment position of developed European countries and Ukraine

Country	Scientific work
Finland	Savolainen (2007), Somervuori (2013)
Sweden	Blomstrom & Kokko (1994), Blomström et al. (1997)
France	Hautcoeur & Cayssials (2017)
Spain	César et al. (2015), Laura et al. (2021)
Ukraine	Klymenko et al. (2018), Kolosok et al. (2018), Kolosok & Myroshnychenko (2015), Malyarets et al. (2021). Oliinyk & Kozmenko (2019)

the results confirm that with such a net investment position, the Czech Republic's economy cannot meet sustainability needs, and its deterioration negatively affects sustainable development. In addition, Lisicke and Maleček (2012) investigate factors that influenced sustainability of the Czech international investment position. But the role of traditional or ESG indices is not underlined.

Table 2 presents works that describe the dynamics and features of the net investment position of some European countries and Ukraine (Table 2).

The analysis of European countries' investment positions is presented primarily in the reports of their national banks in the context of the balance of payments (Savolainen, 2007; Somervuori, 2013; Hautcoeur & Cayssials, 2017; César et al., 2015; Laura et al., 2021).

The influence of stock indices, especially traditional ones, on the net investment positions of Finland, Sweden, France and Spain in these reports is investigated in the context of general analysis of the stock market conjuncture in these countries.

Ukrainian papers (Klymenko et al., 2018; Kolosok & Myroshnychenko, 2015; Malyarets et al., 2021; Pimonenko et al., 2018; Oliinyk & Kozmenko, 2019) contain the general study of the impact of internal and external factors on a country's investment position. Kolosok et al. (2018) found that balancing Ukraine's net international investment position should be accompanied by compliance with the Macroeconomic Imbalance Procedure requirements and a systematic public investment policy on the stock market. But separate studies on the influence of stock market indices on the Ukrainian net investment position are not represented among them.

As can be seen, the study of the relationship between the net international investment position

and stock market indices is not widely represented in the academic literature.

This paper aims to explore the impact of traditional and ESG indices on a country's net international investment position. This is quite a pioneer topic in modern academia.

## 2. DATA AND METHODOLOGY

To model the impact of traditional and ESG indices on the net international investment position, the stock markets of Ukraine (developing country), as well as Finland, Sweden, France and Spain (developed countries) are selected as analysis objects. This choice is made due to the available data for traditional and ESG indices. Three data sets are used in this paper such as a country's net investment position, ESG index, and traditional index. The sources and data periods by country are given in Table 3.

The methodology of this paper includes the following methods:

- Traditional descriptive statistics is used to determine the differences in the statistical characteristics of analyzed data sets;
- Variance analysis (ANOVA-analysis) is used to identify statistically significant differences between the data sets;
- Correlation analysis is performed to identify how synchronous are the variables;
- Granger causality test is applied to clarify the correlation analysis results, as well as to determine which of the indicators is dependent and which is independent;

**Table 3.** Analyzed data sources and their periods

Source: Compiled by the authors.

Country	Traditional index		Responsible index		Net international investment position
	Source	Period	Source	Period	
Ukraine	PFTS	2010–2020	WIG Ukraine	2010–2020	2010–2020
Finland	OMX Helsinki 25	2005–2017	OMX GES Ethical Finland Gross	2005–2017	2005–2017
France	CAC 40	2010–2021	CAC 40 ESG GR	2010–2021	2010–2021
Sweden	OMX Stockholm 30	2005–2017	OMX GES Ethical Sweden	2005–2017	2005–2017
Spain	IBEX 35	2008–2021	FTSE4Good IBEX Index	2008–2021	2008–2021

- R/S data analysis is used to identify probable differences in the data sets and determine the possible predictability of data based on their previous values. In this paper, the methodology similar to Plastun et al. (2018) is applied;
- Autocorrelation function analysis is performed to determine the optimal lag of autoregressive models;
- Regression analysis determines the ability to predict the countries' investment position based on three models' stock exchange market dynamics.
- Model 1. The first variable is the previous value of the investment position indicator with a lag selected from the autocorrelation function analysis. The ESG and the traditional indices are used as additional variables in the model.
- Model 2. The ESG-index is a basic variable.
- Model 3. The basic variable is the traditional index. Models 2 and 3 evaluate the possibility of using ESG indices and traditional indices as a key factor influencing the investment position.
- VAR method is applied to build vector autoregressive models that describe the impact of

ESG indices and traditional indices on the investment position.

### 3. RESULTS

Descriptive statistics for the first differences (Table B1) show that mostly ESG indices are more volatile than traditional ones (standard deviation, the growth rate in traditional indexes is less than in the ESG indices). Accordingly, from the risk point of view, ESG indices do not have advantages for investors. However, the average yield on ESG indices is usually higher than traditional ones. For example, in Ukraine, traditional indices are much more volatile and profitable. This can be explained by the specifics of Ukrainian data, as the traditional stock index is formed from stock prices denominated in hryvnia, and ESG index data are quoted in euros. The volatility of the hryvnia exchange rate may be a decisive factor for the recorded differences.

ANOVA analysis (Table 4) shows that there are no statistically significant differences between the data sets behavior. Thus, previous evidence of the difference between traditional and ESG indices in the context of their volatility can be considered statistically insignificant. The general conclusion from the ANOVA analysis is that a country's investment position, the ESG index and the tradi-

**Table 4.** ANOVA analysis of the dynamics of a country's investment position, ESG index and traditional indices

Country	Investment position and ESG index	Investment position and traditional index	ESG index and traditional index
Finland	1.20 (0.27)	0.40 (0.53)	0.07 (0.79)
Sweden	0.83 (0.36)	1.12 (0.29)	0.70 (0.40)
France	0.00 (0.95)	0.44 (0.50)	2.55 (0.11)
Spain	0.01 (0.91)	0.03 (0.86)	0.01 (0.92)
Ukraine	0.00 (0.98)	2.08 (0.16)	0.01 (0.90)

Note: \* p-value is given in parentheses.



**Table 5.** Correlation analysis of the countries' investment position, ESG and traditional indices

Country	Investment position and ESG index	Investment position and traditional index	ESG index and traditional index
Finland	0.13	-0.04	0.94
Sweden	0.38	0.68	0.95
France	-0.89	-0.33	0.96
Spain	-0.14	-0.43	0.88
Ukraine	-0.03	-0.08	0.65

tional index behave very similarly, at least from the point of dynamic changes.

The correlation analysis results (Table 5) shows that the dynamics of traditional and ESG indices are characterized by a high correlation. In the case of Finland, Sweden, France and Spain, the correlation level varies from 0.88 to 0.96. It means that the behavior of traditional and ESG indices is almost similar. As for Ukraine, the connection is also direct and quite strong. In addition, there is almost no relationship between investment position and traditional or ESG indices. The same situation is observed in Finland.

As for other countries, the results are mixed. In France, there is a strong relationship between the dynamics of ESG indices and the investment position. The correlation coefficient is also negative

for the traditional index, but the correlation coefficient is more than twice lower. The weaker relation is typical for Spain, and the traditional index is more related to the investment position than the ESG index.

In Sweden, the situation is opposite. The relationship between the investment position and the indices is more robust in the traditional index and is direct.

To confirm the correlation analysis results and determine which of the indicators is the regressor or regressant, the Granger test is conducted for both the absolute values and first differences (Table 6).

The results show that the investment position does not affect the stock market in most cases, and the stock market does not affect the investment po-

**Table 6.** Granger tests for countries' investment position, ESG and traditional indices

Country / Parameter	Type of dependence	Investment position (X) and ESG index (Y)		Investment position (X) and traditional index (Y)		ESG index (X) and traditional index (Y)	
		F	p	F	p	F	p
Finland	Y = f(X)	0.08	0.78	0.03	0.85	1.99	0.16
	X = f(Y)	0.34	0.56	0.25	0.61	2.21	0.14
Finland (returns)	Y = f(X)	1.50	0.23	0.10	0.75	0.01	0.91
	X = f(Y)	0.41	0.52	0.02	0.88	0.09	0.76
Sweden	Y = f(X)	5.88	<b>0.02</b>	0.34	0.56	2.26	0.14
	X = f(Y)	2.31	0.13	6.86	<b>0.01</b>	2.66	0.11
Sweden (returns)	Y = f(X)	0.46	0.50	0.41	0.50	0.50	0.48
	X = f(Y)	1.01	0.32	1.64	0.20	1.34	0.25
France	Y = f(X)	1.53	0.22	0.44	0.51	9.91	<b>0.00</b>
	X = f(Y)	1.12	0.30	0.11	0.74	9.35	<b>0.00</b>
France (returns)	Y = f(X)	0.26	0.61	3.43	0.07	0.69	0.41
	X = f(Y)	0.43	0.51	0.22	0.64	0.59	0.44
Spain	Y = f(X)	0.82	0.37	2.98	0.09	0.17	0.67
	X = f(Y)	4.87	0.03	4.63	<b>0.03</b>	0.16	0.69
Spain (returns)	Y = f(X)	1.26	0.27	1.84	0.18	1.17	0.28
	X = f(Y)	0.88	0.35	5.09	<b>0.03</b>	1.63	0.21
Ukraine	Y = f(X)	2.53	0.16	1.60	0.25	0.07	0.80
	X = f(Y)	5.27	<b>0.05</b>	0.77	0.41	0.23	0.65
Ukraine (returns)	Y = f(X)	0.13	0.73	0.29	0.61	1.23	0.31
	X = f(Y)	6.64	<b>0.04</b>	0.05	0.82	0.01	0.94

sition. However, there are several exceptions. In particular, in Ukraine and Spain, the ESG index is a factor that influences a country's investment position. In Sweden, on the other hand, it is typical for the traditional index, while the country's investment position affects the ESG index dynamics.

R/S data analysis is vital to provide additional evidence about potential differences in the analyzed data sets, and determining the possible data predictability based on previous statistics (Table 7). It is impossible to assess the data for Ukraine due to the small size of the data set. As for Finland, Sweden, Spain and France, the investment position dynamics are characterized by strong persistence with a much lower level in the stock market. Moreover, a higher persistence level is observed on the ESG index dynamics. That is, ESG indices are more predictable than traditional ones.

**Table 7.** R/S analysis of countries' investment positions, ESG and traditional indices

Country	Investment position	Traditional index	ESG index
Finland	0.83	0.65	0.72
Sweden	0.84	0.54	0.78
France	0.97	0.51	0.56
Spain	0.83	0.60	0.77

An autocorrelation function analysis is used to obtain detailed results (Table C1). The results show that the optimal lag for describing the investment position dynamics is 1. Since the autocorrelation

function values are pretty high and statistically significant, a model for forecasting the investment position based on previous data can be used.

To determine the real possibility of investment position forecasting based on the stock market dynamics, the next step is to conduct a regression analysis. The study considers the model of the investment position dependent on many factors.

Model 1 is based on the autocorrelation function results and the previous value of the investment position indicator is a basic variable. The ESG index and the traditional index are used as additional factors in the model.

In Model 2, the ESG index is a basic variable; in Model 3, it is the traditional index. Models 2 and 3 evaluate the possibility of using ESG and traditional indices as a basic factor influencing the investment position. The results are shown in Table 8.

As shown in Table 8, all first-order autoregressive models are adequate, as proved by determination coefficients from a minimum of 0.74 for Sweden to a maximum of 0.96 for France. In particular, for most countries (except Spain), the previous value of the investment position and the stock indices dynamics have a statistically significant influence on the dependent variable. Both traditional and ESG indices do not have a statically significant effect. This is additional evidence in favor of the fact that the investment position dynamics is not

**Table 8.** Regression modeling for the indicator of a country's investment position

Country	Model	R <sup>2</sup>	F	$\alpha_0$	$\alpha_1$	$\alpha_2$	$\alpha_3$
Ukraine	Model 1	0.83	5.23 (0.03)	1358.10 (0.93)	0.8240 (0.01)	-34.75 (0.09)	24.42 (0.21)
	Model 2 ESG	0.03	0.01 (0.93)	-37717.2 (0.01)	-1.9876 (0.93)	-	-
	Model 3 Trad.	0.08	0.11 (0.74)	-29589.8 (0.00)	-4.3787 (0.74)	-	-
Finland	Model 1	0.89	55.25 (0.00)	12.2976 (0.11)	0.6908 (0.00)	0.1488 (0.14)	-0.004 (0.16)
	Model 2 ESG	0.12	0.72 (0.40)	-11.2711 (0.26)	0.0280 (0.40)	-	-
	Model 3 Trad.	0.04	0.08 (0.77)	-0.4274 (0.95)	-0.0007 (0.77)	-	-
Sweden	Model 1	0.74	18.63 (0.00)	3.2745 (0.51)	0.7146 (0.00)	0.0441 (0.05)	-0.0145 (0.07)
	Model 2 ESG	0.37	7.85 (0.00)	-15.0652 (0.00)	0.0253 (0.01)	-	-
	Model 3 Trad.	0.65	44.16 (0.00)	-33.5114 (0.00)	0.0230 (0.00)	-	-
France	Model 1	0.96	173.49 (0.00)	-0.4987 (0.86)	0.7778 (0.00)	-0.0038 (0.08)	0.0006 (0.63)
	Model 2 ESG	0.89	158.62 (0.00)	-1.4995 (0.26)	-0.0097 (0.00)	-	-
	Model 3 Trad.	0.32	7.13 (0.00)	-3.2807 (0.46)	-0.0025 (0.01)	-	-
Spain	Model 1	0.93	111.71 (0.00)	-14.0385 (0.01)	0.8095 (0.00)	0.0016 (0.01)	-0.0018 (0.00)
	Model 2 ESG	0.16	1.24 (0.27)	-81.24 (0.00)	-0.0008 (0.27)	-	-
	Model 3 Trad.	0.48	14.88 (0.00)	-66.27 (0.00)	-0.0023 (0.00)	-	-

Note: \* p-value is given in parentheses.



related to the stock market behavior, regardless of whether it is a traditional index or ESG.

As for models 2 and 3, the results are contradicting. For Ukraine and Finland, the impact of stock market variables on the investment position is statistically insignificant. However, for France, Sweden, and partly Spain, models based on traditional or ESG indices are adequate, and stock market variables statistically affect a country's investment position. But the origin of this effect, as evidenced by the correlation analysis results, is different. In France and Spain, stock indices negatively affect the country's investment position, and Sweden positively.

VAR analysis for time series has its peculiarities, which requires taking the following steps:

- checking the time series for stationarity and solving the non-stationarity problem in case of its presence;
- determining the optimal number of lags for the model;
- conducting the Johansen cointegration test;
- making a vector autoregressive (VAR) model and Granger test.

The time-series stationarity is one of the main conditions for constructing a vector autoregres-

sive model. The Dickey-Fuller test checks its presence as it involves unit root identification. Using the STATA/IC 12 software, the following values of this test are obtained for the country sample variables (Table 9).

All criteria in the first step show non-stationarity of the time series data and need to be adjusted for further analysis using the first differences method. After that, all time series are recognized as stationary and can be used in the following stages of research.

Determining the optimal number of lags is an important step in VAR analysis because it influences the model and its parameters. For their optimal selection, it is essential to analyze the level of significance ( $p$ ) and information criteria for each model: Final Prediction Error (FPE), Akaike's information criterion (AIC), Hannan – Quinn information criterion (HQIC), and Schwarz Bayesian information criterion (SBIC). Table 10 shows an example of choosing the optimal number of lags for France for the three models. The asterisks indicate the series with the most optimal lags that have a significant value of  $p$ -statistics and the lowest values of information criteria. This algorithm is similar for all other countries.

Accordingly, the optimal number of lags for the three models varies from one to eight. Table 11 presents the results of choosing the optimal number of lags for the country sample obtained from

**Table 9.** Checking time series for stationarity using the Dickey-Fuller test

Variable	Criteria	FIN	SWE	FRA	ESP	UKR
invest pos	Z(t)	-1.972	-1.460	-0.066	-1.332	-0.796
	MacKinnon $p$ -value	0.299	0.553	0.953	0.615	0.820
esg	Z(t)	0.049	0.703	-0.185	-3.006	-2.010
	MacKinnon $p$ -value	0.962	0.989	0.941	0.054	0.282
tradit	Z(t)	-0.471	-0.917	-1.617	-3.184	-2.051
	MacKinnon $p$ -value	0.898	0.783	0.474	0.051	0.265
critical value	1%			-3.562		
	5%			-2.920		
	10%			-2.595		
<b>Checking the first differences for stationarity</b>						
dinvest pos	Z(t)	-7.339	-7.965	-7.810	-6.902	-10.851
	MacKinnon $p$ -value	0.000	0.000	0.000	0.000	0.000
desg	Z(t)	-5.815	-5.707	-8.325	-5.817	-6.970
	MacKinnon $p$ -value	0.000	0.000	0.000	0.000	0.000
dtradit	Z(t)	-7.670	-7.944	-8.083	-6.475	-7.177
	MacKinnon $p$ -value	0.000	0.000	0.000	0.000	0.000

**Table 10.** Selecting the optimal number of lags for time series in France

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
<b>For model <i>esg – investpos</i></b>								
0	-370.87				1900000.00	20.16	20.19	20.24
1	-305.40	130.94	4.00	0.00	70072.50	16.83	16.92*	17.09*
2	-303.23	4.35	4.00	0.36	77549.70	16.93	17.08	17.37
3	-301.30	3.84	4.00	0.43	87281.90	17.04	17.26	17.65
4	-300.23	2.15	4.00	0.71	103336.00	17.20	17.48	17.99
5	-291.90	16.67	4.00	0.00	83170.60	16.97	17.31	17.93
6	-291.06	1.67	4.00	0.80	101251.00	17.14	17.54	18.27
7	-290.44	1.26	4.00	0.87	125978.00	17.32	17.78	18.63
8	-274.01	32.86*	4.00	0.00	67636.30*	16.65*	17.17	18.13
<b>For model <i>tradit – investpos</i></b>								
0	-608.56				15000000.00	22.20	22.23	22.28
1	-510.44	196.25	4.00	0.00	490867.00*	18.78*	18.86*	18.99*
2	-508.83	3.22	4.00	0.52	535869.00	18.87	19.01	19.23
3	-508.55	0.55	4.00	0.97	614678.00	19.00	19.20	19.51
4	-507.44	2.23	4.00	0.69	684816.00	19.11	19.36	19.76
5	-502.37	10.14	4.00	0.04	662036.00	19.07	19.38	19.87
6	-501.06	2.61	4.00	0.62	735500.00	19.17	19.53	20.11
7	-499.97	2.17	4.00	0.70	825991.00	19.27	19.70	20.37
8	-492.51	14.92*	4.00	0.01	738207.00	19.15	19.63	20.39
<b>For model <i>esg – tradit</i></b>								
0	-531.80				1200000000.00	28.85	28.88	28.94
1	-448.40	166.81	4.00	0.00	16000000.00	24.56	24.65*	24.82*
2	-444.83	7.13	4.00	0.13	16000000.00	24.59	24.74	25.02
3	-442.92	3.81	4.00	0.43	18000000.00	24.70	24.91	25.31
4	-438.39	9.07	4.00	0.06	18000000.00	24.67	24.95	25.45
5	-429.81	17.16	4.00	0.00	14000000.00	24.42	24.76	25.38
6	-427.92	3.77	4.00	0.44	17000000.00	24.54	24.94	25.67
7	-423.86	8.11	4.00	0.09	17000000.00	24.53	24.99	25.84
8	-414.13	19.46*	4.00	0.00	1.3e+08*	24.22*	24.75	25.70

the STATA software given in the appendices. The choice of the optimal number of lags is made by assessing the quality of the VAR model.

The next step is a Johansen cointegration test or trace test, which allows the analysis of the long-term equilibrium between variables relationship. If it is absent, there is a need for further VAR modelling, which is verified by comparing the value of trace and the maximum eigenvalue statistic (max) with critical values. The results of this test are presented in Table 12.

All the values are below the critical values, so there is no cointegration. All this allows moving directly to VAR analysis. Eventually, significant results are not found for all countries considering the optimal lags. Table 13 shows the results that allow identifying the type of relationship ( $Y \rightarrow X$  or  $X \rightarrow Y$ ), its character (direct or indirect) and the lag on which this trend appears.

As a result, it is confirmed that due to the investment position change per unit, the ESG index for Sweden decreases by 1.13 times with a lag of one year; for

**Table 11.** Determining the optimal number of lags

Country	Possible lag periods for the models (optimal are highlighted)		
	<i>esg – investpos</i>	<i>tradit – investpos</i>	<i>esg – tradit</i>
FIN	<b>1/4</b>	1/2/4	1/3/5
SWE	<b>1/5</b>	<b>1/5</b>	<b>3/8</b>
FRA	<b>1/8</b>	1/8	<b>1/8</b>
ESP	1	<b>1/6</b>	<b>1/3/8</b>
UKR	1	<b>1</b>	2/4

**Table 12.** Johansen cointegration test results

Model	Cointegration parameters		FIN	SWE	FRA	ESP	UKR	
esg – investpos	Trace statistic	Rank 0	3.772	14.746	5.884	13.891	6.559	
		Rank 1	0.078	0.357	1.013	1.505	0.854	
	Max statistic	Rank 0	3.694	13.388	4.871	12.386	5.705	
		Rank 1	0.078	0.357	1.013	1.505	0.854	
tradit – investpos	Trace statistic	Rank 0	13.565	10.735	5.647	13.942	6.866	
		Rank 1	0.149	0.012	0.005	1.534	0.902	
	Max statistic	Rank 0	13.417	10.724	5.643	12.408	5.964	
		Rank 1	0.149	0.012	0.0005	1.534	0.902	
esg – tradit	Trace statistic	Rank 0	6.547	14.065	11.781	15.343	10.302	
		Rank 1	0.857	3.663	3.191	3.122	1.769	
	Max statistic	Rank 0	5.689	13.402	8.589	12.821	8.533	
		Rank 1	0.857	3.664	3.191	3.122	1.769	
5% critical value for trace statistic							Rank 0 – 15.41	
							Rank 1 – 3.76	
5% critical value for max statistic							Rank 0 – 14.07	
							Rank 1 – 3.76	

France, it decreases by 0.008 times with a lag of eight years. Instead, changing the ESG index by one unit increases the Spanish investment position by 0.001 times with a lag of one year. For the second model, it is confirmed that a change in the traditional index per unit with a lag of one year increases the investment position by 0.006 for Sweden and 0.001 times for Spain. The largest number of dependencies is found for the third model, which shows the impact of the traditional index on the ESG index (for Sweden in 3 years, France in 1 year and Ukraine in 1 year), and vice versa (for Sweden in 1 and 3 years, France in 1 year, Spain at 1, 2 and 7 years).

## 4. DISCUSSIONS

Large-scale investment support by European countries in response to the pandemic is aimed at improving the EU's net international invest-

ment position through multiplier effects and intensification of the transition to sustainable development. An essential issue in this context is the study of the relationship between traditional and ESG indices as the identification of a country's investment activity and its net investment position.

A bibliometric analysis of 1,747 publications within the topic of net international investment position and behavior of traditional and responsible indices over the period 2000–2021 by In-built Scopus instruments by Elsevier, In-built Web of Science instruments by Clarivate Analytics, Publish or Perish, Google Scholar, VosViever shows that the study of this aspect is not present in the academic literature.

Existing studies do not provide evidences in favor of a direct positive impact of responsible in-

**Table 13.** VAR analysis results

Country	esg (Y) – investpos (X)			tradit (Y) – investpos (X)			tradit (Y) – esg (X)		
	Lag/ Direct.	Coef.	p	Lag/ Direct.	Coef.	p	Lag/ Direct.	Coef.	p
FIN	–	–	–	–	–	–	–	–	–
SWE	L1/ →	–1.133	0.012	L1/ ←	0.006	0.007	L1/ ←	–0.291	0.010
							L3/ →	5.415	0.035
							L3/ ←	–0.359	0.002
FRA	L8/ →	–0.008	0.003	–	–	–	L1/ →	1.228	0.001
							L1/ ←	–0.303	0.002
							L1/ ←	0.998	0.000
ESP	L1/ ←	0.001	0.016	L1/ ←	0.001	0.015	L2/ ←	0.528	0.024
							L7/ ←	–3.117	0.000
UKR	–	–	–	–	–	–	L3 / →	–6.328	0.016

vestment (ESG indices) and traditional indices on the investment position of developed countries (Finland, Sweden, France, Spain) and Ukraine.

The results of this paper provide evidence in favor of an insignificant impact of stock indices on the international investment position. The explanation for such results may be the fact that despite the active development of the institutional infrastructure of the European responsible investment market, the formation of a responsible legislative and the rapid development of local RI markets and their benchmarks (ESG indices), their impact on the net investment position is not yet significant.

In particular, the adoption of the EU action plan for financing sustainable growth (2018), Sustainable Finance Disclosure Regulation (SFDR (2019/2088) Non-Financial Reporting Directive (NFRD EU Directive (2014/95/EU)), EU Taxonomy for sustainable activities 2020/852) is the base for the RI market development in the EU. Each country demonstrates significant progress in integrating these documents into national legislation and stock market trading rules.

France is the country with the most developed stock legislation in sustainable development (in NFRD, Grenelle II Act of 2010, it is noted that reporting on corporate social responsibility in the annual reports of large companies is mandatory).

Its stock market is the largest in Europe in terms of capitalization (3,482,969 million US\$) and the number of ESG bonds in the listing. As of January 2021, 420 ESG bonds from 150 issuers, including sovereign states, development banks, municipalities and financial institutions (Euronext Paris), are presented at Euronext France.

Spain, Finland and Sweden have a relatively lower capitalization of traditional stock markets and the results of the implementation of RI and its benchmarks than France. In Spain, ESG reporting is voluntary for listed companies, and Finland and Sweden have launched only pilot ESG reporting programs, although both countries have the First North Sustainable Bond List from 2018 (Nasdaq Stockholm).

Despite such differentiation in the development levels of the traditional stock market and the RI segment, the stock indices' impact (traditional and ESG) on the investment position of these European countries is not significant. This indicates the need for further improvement of stock and ESG legislation, as well as modelling this impact, in view of more historical data.

In Ukraine, neither traditional stock index nor ESG affects the net investment position, because the stock market is not a source of investment resources. In addition, a responsible stock market simply does not exist in Ukraine.

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## CONCLUSION

This paper aims to explore the impact of traditional indices and ESG indices on the net international investment position of a country. To do this, quarterly data on the net international investment position, traditional and ESG indices (data period 2005–2021) and diamonds (April 3, 1989 – October 11, 2021) for the case of developed (Finland, Sweden, France, Spain) and developing (Ukraine) countries are analyzed.

The results show that ESG indices are characterized by higher volatility in returns compared to their tradition analogues, but these differences are statistically insignificant. Overall, traditional and ESG indices tend to demonstrate a high level of correlation (0.90 on average). Despite this, R/S analysis provides evidence in favor of differences in their persistence: ESG indices are more persistent than traditional ones. This means that the influence of these indices on the net international investment position of a country might be different.

Regression analysis shows that the best proxy to model a country's net international investment position dynamics is the previous values of this indicator. Stock market indices both traditional and ESG. This is in line with the results of R/S and autocorrelation function analysis for the net international investment

position data: The Hurst exponent on average is above 0.80 (strong persistence in data), and the optimal lag for describing the investment position dynamics is 1.

Therefore, stock markets currently do not play a significant role in the formation of the net international investment position (both in the case of developed and developing countries). Despite the growing attention to the ESG segment of the stock market, it is still very close to the traditional one. This indicates the need for further improvement of stock and ESG legislation and development of the responsible investment market.

The contribution of this paper is as follows. The first evidence about the impact of traditional and ESG indices on a country's net international investment position has appeared in the academic literature. This paper provides a number of models to predict the net international investment position.

## AUTHOR CONTRIBUTIONS

Conceptualization: Jaroslav Slepecký, Inna Makarenko.

Data curation: Iryna Zhyhlei.

Formal analysis: Anna Vorontsova, Alex Plastun.

Investigation: Anna Vorontsova.

Methodology: Anna Vorontsova.

Project administration: Jaroslav Slepecký, Inna Makarenko.

Resources: Iryna Zhyhlei.

Supervision: Jaroslav Slepecký.

Validation: Iryna Zhyhlei, Alex Plastun.

Visualization: Iryna Zhyhlei.

Writing – original draft: Jaroslav Slepecký, Alex Plastun, Inna Makarenko, Anna Vorontsova, Iryna Zhyhlei.

Writing – review & editing: Jaroslav Slepecký, Alex Plastun.

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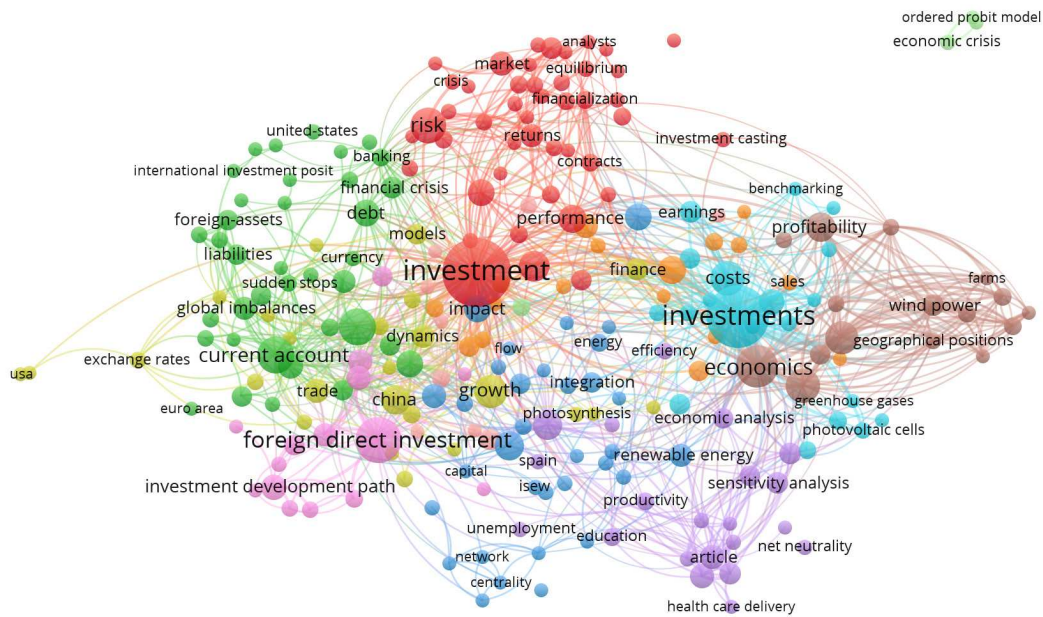
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## APPENDIX A. Bibliometric analysis

Source: Compiled by the authors using VosViewer via Scopus and WoS databases.



**Figure A1.** Bibliometric map of publications' keywords on the query “Net international investment position” according to Scopus and WoS databases in 2000–2021

Source: Compiled by the authors using VosViewer via Publish or Perish databases.



**Figure A2.** Bibliometric map of scientists on the query “Net international investment position” searched in the publications' topics and keywords according to Google Scholar database in 2000–2021

## APPENDIX B

**Table B1.** Descriptive statistics of countries' traditional indices and ESG indices

Parameter	Ukraine		Finland		Sweden		France		Spain	
	ESG	Traditional	ESG	Traditional	ESG	Traditional	ESG	Traditional	ESG	Traditional
Mean	-2.48%	30.34%	2.62%	1.83%	3.11%	1.54%	2.65%	0.89%	-0.07%	-0.29%
Standard error	10.58%	16.16%	1.70%	1.38%	1.38%	1.05%	1.33%	1.17%	1.50%	1.45%
Median	-11.01%	23.78%	3.54%	3.36%	5.63%	2.44%	4.02%	2.48%	-0.70%	-0.53%
Standard deviation	33.47%	68.56%	11.64%	10.84%	9.49%	8.25%	8.81%	9.26%	10.85%	10.47%
Sample variance	11.20%	47.01%	1.36%	1.17%	0.90%	0.68%	0.78%	0.86%	1.18%	1.10%
Excess	-44.15%	118.31%	35.00%	-2.29%	86.96%	-1.92%	344.18%	127.11%	23.45%	47.42%
Asymmetry	62.08%	91.29%	-21.66%	-41.48%	-32.04%	-44.84%	-144.44%	-80.22%	32.50%	7.99%
Interval	106.93%	278.82%	56.06%	49.38%	51.03%	40.25%	45.68%	47.32%	50.97%	54.19%
Minimum	-50.54%	-74.33%	-24.33%	-23.46%	-22.09%	-18.39%	-26.69%	-26.46%	-23.16%	-28.94%
Maximum	56.39%	204.49%	31.72%	25.92%	28.94%	21.86%	18.99%	20.86%	27.81%	25.24%
Sum	-24.79%	546.18%	122.92%	113.37%	146.11%	95.35%	116.60%	55.82%	-3.70%	-15.08%
Observations	10	18	47	62	47	62	44	63	52	52

## APPENDIX C

**Table C1.** Autocorrelation function for the countries' investment position

Country	Time lag k	1	2	3	4	5	6	7	8	9	10	11	12	13
Ukraine	ACF(k)	0.8342	0.6190	0.4187	0.2500	0.0810	-0.1403	-0.3316	-0.4107	-0.4200	-0.4280	-0.4114	-0.3664	-0.2543
	T-STAT	3.82	2.84	1.92	1.15	0.37	-0.64	-1.52	-1.88	-1.92	-1.96	-1.89	-1.68	-1.17
	P-value	0.00	0.00	0.03	0.13	0.36	0.26	0.07	0.04	0.03	0.03	0.04	0.05	0.13
Finland	T-STAT	0.8677	0.7268	0.5955	0.4855	0.4504	0.3836	0.2802	0.1762	0.0950	0.0493	0.0226	-0.0195	-0.0526
	T-STAT	6.94	5.81	4.76	3.88	3.60	3.07	2.24	1.41	0.76	0.39	0.18	-0.16	-0.42
	P-value	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.08	0.23	0.35	0.43	0.44	0.34
Sweden	ACF(k)	0.8571	0.7272	0.6459	0.5524	0.4558	0.3610	0.2657	0.1807	0.0999	0.0757	0.0881	0.1001	0.1362
	T-STAT	6.86	5.82	5.17	4.42	3.65	2.89	2.13	1.45	0.80	0.61	0.70	0.80	1.09
	P-value	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.21	0.27	0.24	0.21	0.14
France	ACF(k)	0.8803	0.7759	0.6783	0.5981	0.5334	0.4562	0.3757	0.3244	0.3091	0.2985	0.2604	0.2199	0.1782
	T-STAT	7.04	6.21	5.43	4.78	4.27	3.65	3.01	2.60	2.47	2.39	2.08	1.76	1.43
	P-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.04	0.08
Spain	ACF(k)	0.9182	0.8363	0.7100	0.6048	0.4989	0.4115	0.3398	0.2918	0.2416	0.2032	0.1580	0.1352	0.0934
	T-STAT	6.68	6.09	5.17	4.40	3.63	3.00	2.47	2.12	1.76	1.48	1.15	0.98	0.68
	P-value	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.07	0.13	0.16	0.25