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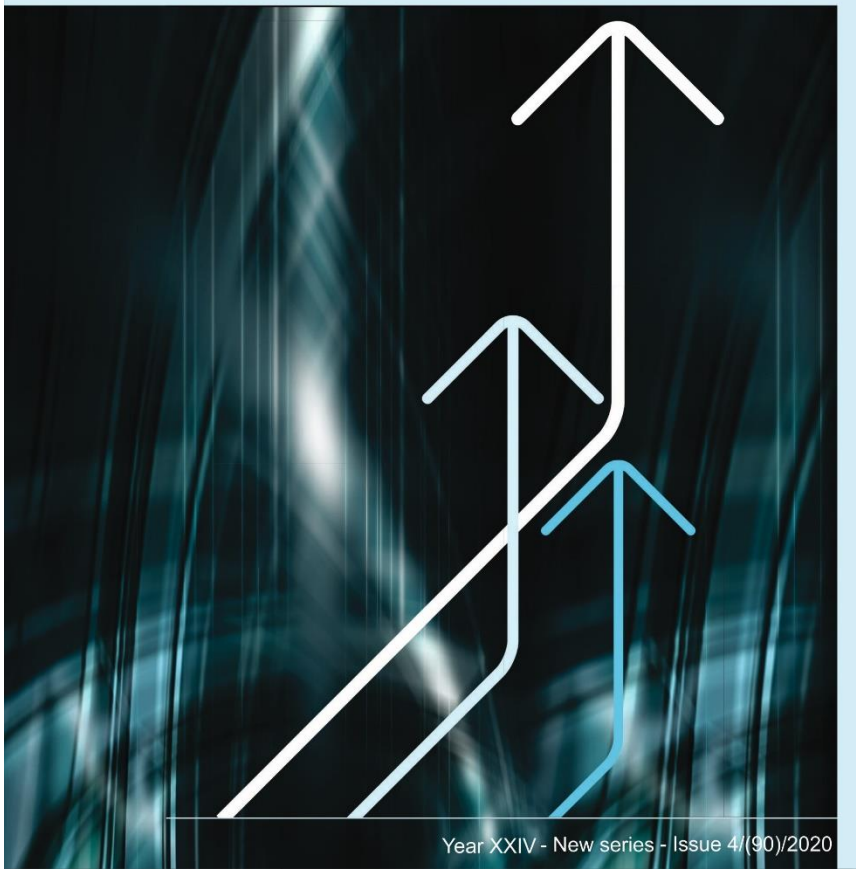

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“VICTOR SLĂVESCU” CENTRE FOR FINANCIAL
AND MONETARY RESEARCH

FINANCIAL STUDIES

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Contents

THE EFFECTS OF COVID-19 OUTBREAK ON FINANCIAL MARKETS

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Abstract

The purpose of this paper is to measure the risks posed by the COVID-19 outbreak on financial market indicators, which caused uncertainty and fear all over the world. In the paper, the Fourier KPSS unit root test, which helps to measure structural breaks more precisely by means of the Fourier transformations in time series, the Fourier-SHIN Cointegration Test to determine long-term relationships between time series, and the Fourier Granger Causality Test to determine causality relationships are used. As a result of these tests applied on the daily price series between 31.12.2019 and 01.05.2020, it has been found that in the long term, the COVID-19 outbreak has a significant effect on stock markets, crude oil representing oil markets, and fear index; but no significant effect on Bitcoin which represents money markets. In the short term, it is concluded that COVID-19 has had a significant effect on stock markets, crude oil, fear index, and Bitcoin.

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1. Introduction

Our world has experienced many diseases, wars, and disasters globally and regionally since its formation. Those kinds of events have had some direct and indirect effects on humanity in the short and long term. Although, humanity has tried to minimize the effects of such events with the precautions taken, the effects experienced have been removed to some extent. Even if these effects disappeared or are eliminated, this has taken a great time.

While the effects of regional disasters experienced in the past were felt particularly in that region, nowadays, the events and developments in any region of the world have direct and indirect global effects. Without a doubt, the fact that today's world has become globalized and integrated has a significant share in this. Today, we are fighting the epidemic of COVID-19, which has and will continue to have global effects similar to those in the past. It is useful to give brief information about the epidemic. The new generation coronavirus SARS COV 2 belongs to the same family of dangerous viruses such as MERS and SARS. However, the most crucial feature that distinguishes SARS COV 2 from these viruses is that it can be much more contagious and, therefore, much more deadly. While this virus is known to be widespread among animals, it has gained the feature of spreading between humans as it evolves, and the new disease that emerged with this evolution has been named COVID-19. The first case of the outbreak occurred on December 1, 2019, in Wuhan, the capital of China's Hubei region, and on December 31, this information was confirmed by the China office of the World Health Organization. From December 31, 2019 to January 3, 2020, the total number of cases reached 44, with the first death on January 11, 2020. The World Health Organization obtained information from the Chinese Health Commission indicating that the outbreak occurred in a seafood market in Wuhan city and declared a pandemic on March 11, 2020 as the outbreak turned into a global threat (WHO, 2020)

It is a fact that this epidemic will cause many economic problems, including financial markets. The epidemic continues to

spread while this article is written. There is no continent in the world where the case is not seen, and the number of countries where the case is not seen is just a few. It is a mystery exactly how much the outbreak will spread in the future. However, the effects of the outbreak that has and will have on finance and other areas in the future will be of great interest to researchers.

This study considers only the process from the beginning of the outbreak to become a global crisis, until the completion of the study and aims to measure the impact of the outbreak on selected financial markets and to lead to more comprehensive studies on this subject.

It is thought that this globally threatening epidemic will have an impact on financial markets and lead to significant economic problems. Based on the developments in past outbreaks, it is possible to make predictions about the effects of this outbreak.

Even a non-global outbreak has adverse effects on trade, travel, and tourism activities in the regions affected by the epidemic considering the examples experienced in the past. For example, during the HIV and AIDS epidemic, there was a permanent change in consumer behavior, and a worldwide decline in expenditures and domestic demand posed an important challenge for the global economy (Haacker, 2004). Therefore, such long-term outbreaks discourage foreign investments directly and indirectly and negatively affect financial markets. Considering all these explanations, it is clear that global and regional outbreaks in the past brought along some problems. These problems are as follows (Bloom et al., 2018);

- Increase in the health system costs,
- The collapse of the health system as a result of excessive demand for it, and difficulty in dealing with even routine health problems,
- Employment losses,
- Retardation in the touristic activities
- Problems in transportation and education,
- Decreasing mobility in financial markets and experiencing financial losses,
- Slowdown in national and international trade

The adversities similar to those listed above and maybe, even more, will also be seen in the outbreak of COVID-19. Countries should always be prepared to prevent an epidemic and to overcome the problems mentioned above with minimal damage. On the bright side,

countries do not have to invest considerable amounts in coping with these problems. (Fan et al., 2018).

COVID-19 has had and will have many possible effects on the financial markets included in this study. The outbreak is likely to pose risks to banks, which are an essential element of the money markets, during the period of the economic downturn due to the possibility of non-performing loans and excessive bank transactions. It is expected that the epidemic will have a long-term impact on companies related to financing and capital costs. As regards the impact of the outbreak on the financial markets, looking at what effects such recent terrorist attacks and disasters have had on the financial markets will help to understand the possible effects of the COVID-19 outbreak we are experiencing (Goodell, 2020). Because, from past to present, a limited number of studies investigated the effects of epidemic diseases on financial markets (Al-Awadhi et al., 2020). In recent studies, it has been determined that such disasters and terrorist events have a short-term impact on financial markets (Brounen and Derwall, 2010).

In the light of these explanations, GDP is expected to decrease by $130 billion in Turkey, and $9.170 billion throughout the world (McKibbin and Fernando, 2020). This situation shows that the global epidemic of COVID-19 harms the global economy on a scale not seen since the Great Depression and will continue to cause considerable damage to individual livelihoods, businesses, industries and the whole economy (Laing, 2020).

2. Literature Review

There are several studies in the literature measuring the impact of diseases and outbreaks on the financial markets. These studies have mostly investigated the effects of outbreaks that arose in the past like SARS, MERS, Ebola, AIDS on financial markets. The number of studies evaluating the impact of COVID-19, which the world is encountering and suffering nowadays on financial markets, is not sufficient. The main reasons behind it are that the epidemic is brand new and the difficulties encountered in reaching enough data to do detailed analyzes. Accordingly, the studies about the current COVID-19 outbreak and past illnesses and outbreaks are stated below.

Nippani and Washer (2004) investigated the impact of the SARS outbreak on the financial markets of Thailand, Singapore, Hong Kong, the Philippines, Indonesia, Canada, Vietnam, and China. In the study, t-test and non-parametric Mann-Whitney tests were performed

in order to compare the data obtained between June 1, 2002 and February 25, 2003 with the S&P 1200 global index. As a result of the analysis, it is concluded that SARS has an impact on the Chinese and Vietnamese stock markets and no negative impact on the stock markets of other countries.

Loh (2006) investigated to what extent the airline companies traded in the financial markets of Taylan, China, Canada, Hong Kong, and Singapore are affected by SARS. For this purpose, F-test, Siegel-Tukey, Bartlett, Levene, and Brown tests were performed by using the data obtained from December 1, 2002 to July 5, 2003. As a result of the analysis, it is indicated that the epidemic harmed airline companies.

Giudice and Paltrinieri (2017) examined monthly flows and performances of 78 equity mutual funds in African countries for the period of 2006-2015. As a result of the analyzes and examinations, it is concluded that two significant events, which are Ebola and the Arab Spring, have significantly affected the funds flows, fund performance, expenses, and market returns.

Chen et al. (2018) investigated the effects of SARS by examining the long-term relationship between the stock exchanges of Japan, Taiwan, Hong Kong, and Singapore, and the Chinese stock market. For the study, they conducted a cointegration test using the weekly data from 1998 to 2008 and concluded that the SARS outbreak weakened the long-term relationship between the four financial markets and China.

Goodell (2020) made comments and inferences about the economic effects of the COVID-19 outbreak considering past epidemics and disasters. He stated that this study will shed light on future studies on COVID-19.

Nemec and Špaček (2020) focused on the macro-socioeconomic effects of the COVID-19 pandemic. They qualitatively examined the information contained in the restrictive regulations of national governments, data published by government bodies, international statistics and media articles published before June 30, 2020 to investigate the impact of the pandemic on local budgets. The Czech Republic and Slovakia were included in the scope of the research and they concluded that the level of financial imbalance of the COVID-19 crisis was not proportional to the situation at the central level and that the municipal financial resources were not proportional to their responsibilities as stated in the constitution. They stated that the central administration in both countries is insufficient in combating the

pandemic and this will cause problems in many areas, especially in culture and sports.

Ayittey et al. (2020) discussed the possible effects of coronavirus on China and the world. They stated that China is likely to lose 62 billion dollars in the first quarter of the year, and the world is expected to lose more than 280 billion dollars in the same period.

Laing (2020) examined the effect of coronavirus on certain precious metals. In order to measure the price changes, he compared the prices of aluminum, copper, gold, lead, nickel, and zinc for the period between March 4, 2020 and April 2, 2020. As a result of this comparison, it is found that the price of aluminum, copper, gold, lead, nickel, and zinc decreased by 15%, 14%, 2%, 10%, 11%, and 6% respectively in the period given.

Estrada et al. (2020b) investigated the impact on the performance of ten stock markets, including the FTSE to assess the determinants of capital market behavior in the event of an infectious disease outbreak, COVID-19's S&P 500, TWSE, Shanghai Stock Exchange, Nikkei 225, DAX, Hang Seng, UK-FTSE, KRX, SGX and Malaysia. As a result of the study, the researchers stated that the epidemic could be disastrous for all countries' economies and could cause similar damages to the 1929 Crisis on ten major stock markets worldwide.

Luo and Tsang (2020) investigated the impact of the COVID-19 outbreak on China and the global economy. For this purpose, in order to estimate output loss from labor loss by using a network approach, they looked at how the decline in the labor force in Hubei province affects production in China through input-output relations between states. As a result of the analysis, they concluded that the Chinese workforce had a production loss of about 4%, and global production decreased by 1% due to the economic contraction in China. With this result, they stated that approximately 40% of the impact is indirect, resulting from supply chain spreads inside and outside China.

Estrada et al. (2020a) investigated how the coronavirus outbreak affected China's economic performance. For the research, they developed a new model called "Massive Infections and Contagious Diseases Economic Simulator (IMICDE-Simulator)". In the analysis performed to investigate the effects of the coronavirus, they used the indicators given by the simulator and carried out the analysis in this framework. As a result of the analysis, they concluded that the epidemic reduced the potential growth of China by 2% compared to the

previous year, and this is three times more negative compared to the one experienced in SARS. Besides, they mentioned that the epidemic could have more impact on other economies.

Cepoi (2020) tried to measure the relationship between the news about COVID-19 and stock market returns in the six countries most affected by the pandemic (USA, UK, Germany, France, Spain and Italy) using a panel regression model. Stock market return (RET), The Panic Index (PI), The Media Hype Index (HY), The Fake News Index (FNI), The Country Sentiment Index (CSI), The Contagion Index (CTI), The Media Coverage Index (MCI), Sovereign CDS, Gold Price, Sentiment Index, Intercept, Lagged Returns and Observations were used. The analysis showed that exchanges offer asymmetric correlation with information about COVID-19, such as fake news, media coverage or contagion. In addition, it was observed that gold yield has a positive non-linear correlation with stock markets and gold is a "Safe Harbor" during the down-up periods. The results showed that more intensive use of appropriate communication channels is required to reduce the financial turmoil associated with COVID-19.

Zeren and Hizarcı (2020) conducted the Maki Cointegration Test using the daily data of death and case numbers between January 23, 2020 and March 13, 2020 to determine the possible effects of the COVID-19 outbreak on the stock markets. They found a parallel movement between the number of deaths and the financial markets included in the research, as well as a cointegration relationship between the daily number of cases and SSE, KOSPI, and IBEX35. As a result, they concluded that it would be much less risky for investors to invest in gold markets, virtual currencies, derivatives markets, or markets of countries where the epidemic is not observed during such crisis periods.

Wójcık and Ioannou (2020) conducted a study on the actual and potential impact of the pandemic on financial markets and sectors and the tendency of the epidemic to affect the financial environment. The study stated that a financial slowdown and a steady increase in financial-related business services are expected, but local and regional financial centers are likely to face greater challenges than leading international centers.

Zhang, Hu, and Ji (2020) investigated the country-specific and systematic risks COVID-19 poses to financial markets. For this purpose, they collected the daily data of 12 countries from February 7, 2020 to March 27, 2020, and made a correlation analysis. As a result

of the correlation analysis, they concluded that the epidemic increased not only national risks but also systematic risks in the financial markets and stated that the epidemic caused uncertainty, risk, and economic losses on the financial markets of these countries.

Al-Awadhi et al. (2020) have investigated the effect of the coronavirus outbreak on financial markets. They included 82 companies operating in The Hang Seng Index and Shanghai Stock Exchange Composite Index and divided them into ten sectors according to their fields of activity. Then, they collected daily data of validated cases, deaths, and stock market values of companies from January 10, 2020 to March 16, 2020. By using panel data analysis, they concluded that the number of daily confirmed cases and daily death cases had significant negative effects on the financial markets of the countries included in the study.

3. Methodology

The fact that financial assets have unit roots causes permanent effects on the value of the financial asset due to some random shocks. Exposure of non-stationary series to shock causes high degree fluctuations to persist (Yılancı, 2017). Therefore, revealing the existence of the unit root gained importance, especially in the 1980s.

Failure to measure the stationary of financial time series in which short and long-term relationships are investigated, in the presence of structural breaks with sensitive tests may cause changes in analysis results and unsubstantial interpretations.

As the structural changes lead to large-scale changes in the prices of non-stationary financial assets, the need for developing unit root tests, taking into account a series of structural breaks pioneered by Perron (1989) has increased. Unlike Perron (1989) unit root test, based on the assumption that structural breaks are known, Zivot and Andrews (1992), Lumsdaine and Papell (1997), Lee and Strazicich (2003, 2004) developed unit root tests investigating the existence of unit root under the assumption of one or two structural breaks with an unknown date. In particular, Lee and Strazicich (2003, 2004) introduced the LM to eliminate the shortcomings of the ZA and LP unit root tests stating that in ZA and LP tests, the rejection of the H_0 hypothesis will not require rejecting the existence of the unit root (Yılancı, 2009).

Although the unit root tests mentioned above, which take into account the structural breaks, assume that the structural break dates

are unknown, the structural breaks of the series which are tested for unit root existence, are determined in a preliminary form.

In ADF-type unit root tests, the null hypothesis suggests that the series has a unit root process while in KPSS-type tests, the null hypothesis states that the series is stationarity. KPSS type stationary test proposed by Kwiatkowski et al. (1992) has been developed by Becker et al. (2006). In this unit root test, structural changes are taken into account using the Fourier function. Thanks to the Fourier functions, changes in the series can be precisely estimated. Since the number, structure, and position of the structural changes are difficult to predict, the Fourier functions eliminate this imperative and allow getting better results. The unit root, cointegration and causality tests, which enable the coefficients to be transformed into trigonometric form with the help of the Fourier transformations, also take into account the effects of external shocks such as structural breaks that financial time series are exposed to. The tests applied in the Fourier form help to make accurate analyzes in financial time series where structural breaks are observed.

The data generation process for the stationary test developed by Becker et al. (2006) is as follows:

$$Y_t = X_t'\beta + Z_t'\gamma + r_t + \epsilon_t \quad (1)$$

$$r_t = r_{t-1} + u_t \quad (2)$$

where ϵ_t is a stationary process and u_t is a constant variance i.i.d. is a process.

In the first stage, in order to calculate the test statistics required to test the stationarity hypothesis, one of the following two models is estimated and residuals are obtained:

$$y_t = \delta_0 + \delta_1 sin\left(\frac{2\pi kt}{T}\right) + \delta_2 cos\left(\frac{2\pi kt}{T}\right) + v_t \quad (3)$$

$$y_t = \delta_0 + \beta_t + \delta_1 sin\left(\frac{2\pi kt}{T}\right) + \delta_2 cos\left(\frac{2\pi kt}{T}\right) + v_t \quad (4)$$

While the stationary at level hypothesis is tested with the model (3), the trend stationarity hypothesis is tested using the model (4).

Test statistics can be calculated with the following formula:

$$\tau_\mu(k) \text{ or } \tau_\tau(k) = \frac{1}{T^2}\frac{\sum_{t=1}^{T}\tilde{S}_t(k)^2}{\tilde{\sigma}^2} \quad (5)$$

where $\tilde{S}_t(k) = \sum_{j=1}^{t}\tilde{e}_j$ and $\tilde{e}_j$ is the residuals from the model (3) or (4).

A non-parametric estimation of σ can be obtained by selecting lag parameter l and $w_j, j = 1,2,\dots,l$ as follows:

$$\delta^2 = \tilde{\gamma}_0 + 2\sum_{j=1}^{l} w_1\tilde{\alpha_j} \quad (6)$$

where $\tilde{\alpha}_j$ is the j. sample autocovariance of the residuals from the model (3) or (4).

The significance of the Fourier function is tested using the F test statistic. The F test statistic for the Fourier model with K frequency is as follows:

$$F_i(k) = \frac{(SSR_0 - SSR_1(k))/2}{SSR_1(k)/(T-q)}, \quad i = \mu,\tau. \quad (7)$$

where $SSR_1(k)$ is the sum of the residual squares obtained from the regression equation (7), q is the number of explanatory variable and SSR_0 represents the sum of the residual squares obtained from the model in which trigonometric terms are not added. In order to use the F test, the stationary hypothesis must not be rejected. Suitable critical values for the F test and stationary test are included in the study of Becker et al. (2006) as a table.

In the literature, there are numerous cointegration tests developed by Engle-Granger (1987), Gregory-Hansen (1996), Johansen et al. (2000), Hatemi-J (2008) and so on. However, these tests require to determine the number and form of structural changes previously. The new cointegration test developed by Tsong et al. (2016) takes into account unknown form and number of structural breaks by using the Fourier trigonometric functions. This new method called Fourier-Shin Cointegration Test considers the cointegration regression equation as follows:

$$y_t = d_t + x_t'\beta + n_t, \qquad t = 1,2,\dots,T \quad (8)$$

where $n_t = \gamma_t + v_{1t}$, $\gamma_t = \gamma_{t-1} + u_t$ with $\gamma_0 = 0$, and $x_t = x_{t-1} + v_{2t}$. Here u_t is an iid process with zero mean and variance σ_u^2. Therefore, γ_t is a random walk with mean zero. The deterministic component d_t in Eq. (8) can be defined as follows:

$$d_t = \sum_{i=0}^{m} \delta_i t^i + f_t, m = 0 \; or \; m = 1 \tag{9}$$

$$f_t = \alpha_k sin\left(\frac{2k\pi t}{T}\right) + \beta_k cos\left(\frac{2k\pi t}{T}\right) \tag{10}$$

where (k) denotes the Fourier frequency value, t is trend, and T represents the sample size. The null hypothesis of cointegration against the alternative of non-cointegration could be expressed as:

$$H_0: \sigma_u^2 = 0 \; versus \;\; H_1: \sigma_u^2 > 0 \tag{11}$$

In order to test the null hypothesis in Eq. (11), the model described in equation (9), (10) could be rephrased as:

$$y_t = \sum_{i=0}^{m} \delta_i t^i + \alpha_k sin\left(\frac{2k\pi t}{T}\right) + \beta_k cos\left(\frac{2k\pi t}{T}\right) + x_t'\beta + v_{1t} \tag{12}$$

The FSHIN Cointegration test statistic (denoted by CI_f^m) to test the null of cointegration with structural breaks against the alternative of non-cointegration is given by:

$$CI_f^m = T^{-2}\widehat{w}^{-2} \sum_{t=1}^{T} S_t^2 \tag{13}$$

where $S_t = \sum_{t=1}^{T} \hat{v}_{1t}$ is the partial sum of the ordinary least squares (OLS) residuals from Eq. (12) and w_1^2 denotes the consistent estimator for the long variance of v_{1t}.

In the study, the existence of the causality relationship between variables was investigated with the Fourier Granger causality test developed by Enders and Jones (2015). Enders and Jones (2015) introduced a flexible Fourier form to capture changes in multiple soft averages in a short-term VAR system. The authors limited the VAR model by forcing the limitations envisaged by the Granger causality test

to take into account the effect of neglecting structural breaks in a linear VAR model on Granger causality tests. The findings of the authors showed that there was little interaction between the variables and that the significant responses are such that series tend to respond only to their own shocks.

The authors then defined the deterministic regressors as follows:

$$z_t = \delta(t) + \sum_{1}^{11} A_1 z_{t-1} + e_t \quad (14)$$

$$\delta(t) = [\delta_1(t), \delta_2(t), \delta_3(t), \delta_4(t)]' \quad (15)$$

and each intercept δit depends on n Fourier frequencies such that:

$$\delta_i(t) = \alpha_i + b_i t + \sum_{k=1}^{n} \alpha_{ik} sin\left(\frac{2\pi kt}{T}\right) + b_{ik} cos\left(\frac{2\pi kt}{T}\right) \quad (16)$$

Unlike the Granger causality results obtained from the linear VAR model, Enders and Jones (2015) found stronger relationships and richer sets of interactions between the variables by adding trigonometric functions to the model.

4. Data and the Empirical Results

In this study, the effect of the COVID-19 outbreak on financial markets is evaluated. The results and findings obtained are important for people who play an active role in the stock market to understand and predict stock returns and movements during the pandemic.

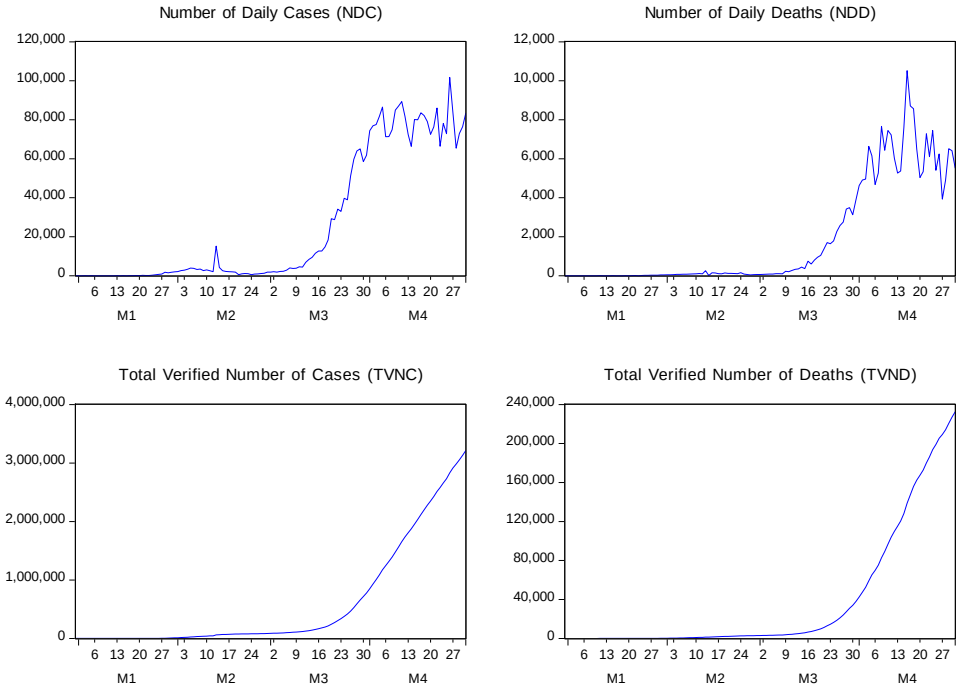
For this purpose, the period between 31.12.2019 and 01.05.2020 is included in the study. Daily data are used for all price series included in the study. In order to evaluate the effects of coronavirus on financial markets, some financial markets are included in the research. These are; the Italian stock market (FTSE MIB), the French stock market (CAC 40), the British stock market (FTSE 100), the Chinese stock market (SHANGAI), and the Fear Index (VIX). In addition, ounces of gold (OUNCE) representing the precious metal market, crude oil (WTI) representing the energy market, and bitcoin (BTC) representing the cryptocurrency market are among the items to

be examined in the study. All these elements mentioned above constitute the dependent variables of the study.

Total Verified Number of Cases (TVNC), Total Verified Number of Deaths (TVND), Number of Daily Cases (NDC), and Number of Daily Deaths (NDD) are chosen as independent variables of the study. Data on these variables are obtained from the website "ourworldindata.org". The line graphs of Number of Daily Cases (NDC), Number of Daily Deaths (NDD), Total Verified Number of Cases (TVNC), and Total Number of Verified Deaths (TNVD-), which are the independent variables of the study, are shown in Figure 1.

Figure 1

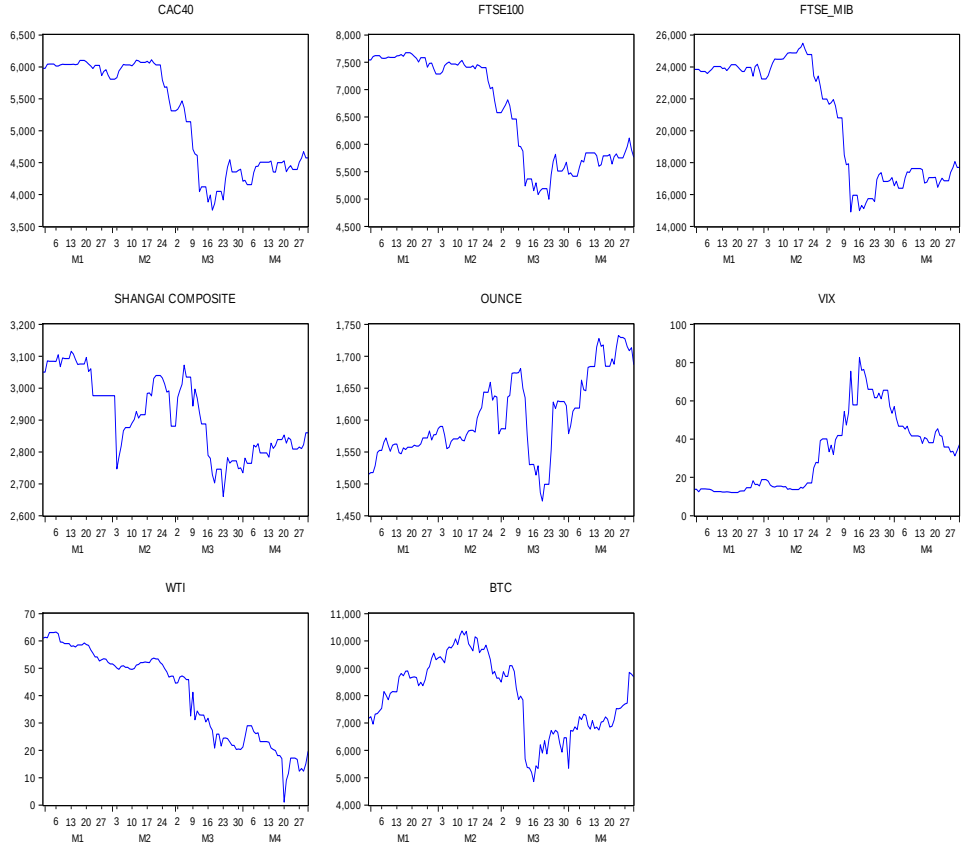
Daily price series regarding independent variables



Daily price series of the study's dependent variables which are the Italian stock market (FTSEMIB), the French stock market (CAC40), the British stock market (FTSE100), the Chinese stock market (SHANGAI), the Fear Index (VIX), Bitcoin (BT-C), Ounce of Gold (OUNCE) and Crude Oil (WTI) are shown in Figure 2.

Figure 2

Daily price series regarding dependent variables



When the charts of all financial assets as of March 2020 are analyzed, it can be seen that significant decreases occurred in all financial markets and the VIX index increased.

In order to evaluate the effect of COVID-19 outbreak on financial markets, the effects of changes in Number of Daily Cases (NDC), Number of Daily Deaths (NDD), Total Verified Number of Cases (TVNC) and Total Number of Verified Deaths (TNVD) on the Italian stock market (FTSE_MIB), the French stock exchange (CAC40), the British stock exchange (FTSE100), the Chinese stock exchange (SHANGAI), the Fear Index (VIX), Bitcoin (BTC), Ounce of Gold (OUNCE) and Crude Oil (WTI) are investigated.

First of all, it is necessary to conduct a stationarity test for the variables mentioned above. As mentioned in the methodology section, the FKPSS unit root test is implemented in the study. In the FKPSS unit root test, the null hypothesis is that the series is stationary. The test results are given in Table 1.

Table 1

Fourier KPSS Unit Root Test Results

Level	Frequency	Min SSR	FKPSS	KPSS	F Stat.
lnTVNC	1	1485558	0.511249***		60.32***
lnNDC	1	1647999	0.423009***		47.54***
lnNDD	1	9529202	0.470167***		77.38***
lnTVND	1	1746269	0.512016***		64.80***
lnBTC	1	0.241005	0.218039**		123.39***
lnCAC40	1	0.096856	0.196760**		308.32***
lnFTSE100	1	0.069726	0.235439**		347.18***
lnFTSEMIB	1	0.125325	0.175856**		289.71***
lnOUNCE	2	0.022441	0.754373***		33.14***
lnSHANGAI	1	0.021829	0.225168**		48.60***
lnVIX	1	1105033	0.172377**		422.29***
lnWTI	1	3823441	0.473817***		62.35***
1st Diff.	Frequency	Min SSR	FKPSS	KPSS	F Stat.
D(lnTVNC)	2	1647679	0.329952	0.387836	1.895
D(lnNDC)	2	2454385	0.072922	0.229203	2.935
D(lnNDD)	2	2207312	0.086305	0.084105	1.374
D(lnTVND)	2	1920076	0.300619	0.259411	1.906
D(lnBTC)	1	0.363565	0.035919	0.123260	1.906
D(lnCAC40)	1	0.066110	0.051429	0.124777	2.152
D(lnFTSE100)	2	0.056192	0.124419	0.132399	1.812
D(lnFTSEMIB)	2	0.087364	0.129699	0.125102	2.105
D(lnOUNCE)	3	0.015825	0.040886	0.035977	1.443
D(lnSHANGAI)	3	0.019820	0.138465	0.065277	1.352
D(lnVIX)	1	1140474	0.052856	0.182625	2.305
D(lnWTI)	3	0.561779	0.157658	0.331187	1.052

****, ** and * represent 1%, 5% and 10% significance levels respectively. Null Hypothesis "… is stationary".*

As can be seen in Table 1, according to the FKPSS Test results at the level, the test statistics for all series are greater than the critical values. Therefore, the null hypothesis stating that the series is stationary is rejected for all series. The ability to test the significance of trigonometric terms depends on the precondition that the null hypothesis cannot be rejected (Yılancı, 2017). Since the null hypothesis was rejected in level values for all series, both the FKPSS

test statistics and the F test were applied for the differentiated series. It was determined that all series were stationary after taking the first difference. Since the test statistics are less than critical values for all series, the null hypotheses stating that the series is stationary are not rejected. Since it was found that trigonometric terms with the Fourier transformation are not significant, the series are found to be stationary at the first difference according to the standard KPSS test. In brief, according to the results of Table 1, all series are determined to be I[1].

Table 2

The Fourier – Shin Cointegration Test Results

	Frequency	Min SSR	Fourier Cointeg. Test Stat.	Shin Test Stat.	F Stat.
NDC - BTC	2	9.805.982	0.4888***	0.8387***	13.590***
NDC - CAC40	2	3.710.850	0.2029	0.2966	11.3946***
NDC - FTSE100	2	3.296.216	0.1696	0.2656	14.334***
NDC - FTSEMIB	2	4.401.541	0.2460	0.3336**	9.593***
NDC - OUNCE	**1**	**1.090.769**	**0.1978****	**0.5562*****	**0.503**
NDC - SHANGAI	3	3.383.122	0.2512	0.2577	3.802***
NDC - VIX	2	2.382.989	0.0916	0.2628	35.229***
NDC - WTI	**1**	**5.230.376**	**0.0988**	**0.3046**	**2.667**
NDD - BTC	2	3.668.248	0.4804***	0.9504***	46.611***
NDD - CAC40	2	7.102.348	0.1651	0.3168**	114.448***
NDD - FTSE100	2	6.077.856	0.1045	0.2866	232.315***
NDD - FTSEMIB	2	1.105.621	0.2526	0.3691**	53.749***
NDD - OUNCE	1	5.262.592	0.2061***	0.6467***	4.170**
NDD - SHANGAI	2	1.870.958	0.3133**	0.5406***	22.030***
NDD - VIX	2	8.594.228	0.2088	0.4008**	244.647***
NDD - WTI	1	2.593.334	0.1129	0.3916**	4.555**
TVNC - BTC	1	7.333.911	0.2841***	0.9532***	12.836***
TVNC - CAC40	2	2.785.453	0.2619	0.3701**	20.072***
TVNC - FTSE100	2	2.273.288	0.2285	0.3354**	39.524***
TVNC - FTSEMIB	2	3.616.061	0.3035**	0.4101**	19.700***
TVNC - OUNCE	1	5.092.151	0.1856**	0.7075***	4.507**
TVNC - SHANGAI	2	2.737.019	0.2492	0.4403**	49.129***
TVNC - VIX	2	1.050.194	0.1130	0.3787**	151.003***
TVNC - WTI	1	3.176.993	0.1334**	0.4127**	10.721***
TVND - BTC	1	8.765.947	0.2903***	0.9691***	9.701***
TVND - CAC40	2	2.783.411	0.2372	0.3758**	36.160***
TVND - FTSE100	2	2.273.980	0.1964	0.3429**	68.761***
TVND - FTSEMIB	2	3.658.908	0.2877**	0.4136**	27.272***
TVND - OUNCE	1	5.805.349	0.1898**	0.7397***	4.775**
TVND - SHANGAI	2	3.491.393	0.2531	0.4679**	29.971***
TVND - VIX	2	1.119.943	0.1153	0.4013**	160.686***
TVND - WTI	1	3.664.198	0.1458**	0.4214**	9.383***

	Fourier Cointeg. Critical Values			F-Stat. Critical Values		SHIN Critical Value	
	k=1	*k=2*	*k=3*				
1%	0.198	0.473	0.507	*1%*	5.774	*1%*	0.533
5%	0.124	0.276	0.304	*5%*	4.066	*5%*	0.314
10%	0.095	0.200	0.225	*10%*	3.352	*10%*	0.231

****, ** and * represent 1%, 5% and 10% significance levels respectively. "null hypothesis; "There is a significant long-term relationship between variables."*

According to the degrees of freedom associated with the Fourier cointegration test statistics in Table 2, the results of the Fourier cointegration test statistics for NDC-CAC40, NDC-FTSE100, NDC FTSEMIB, NDC-SHANGAI, NDC-VIX, NDC-WTI, NDD-CAC40, NDD FTSE100, NDD-FTSEMIB, NDD-VIX, NDD-WTI, TVNC-CAC40, TVNC-FTSE100, TVNC-SHANGAI, TVNC-VIX, TVND-CAC40, TVND-FTSE100, TVND-SHANGAI and TVND-VIX are smaller than FSHIN critical values. For example, the Fourier cointegration test statistic for NDC-CAC40 (0.2029) is less than the FSHIN critical value of k=2 for 5% significance level (0,276). In this case, "H_0: There is a significant long-term relationship between variables" hypothesis could not be rejected. It is seen that all the financial stock markets mentioned above have a long-term relationship with daily cases/deaths (NDC and NDD) and total cases/deaths (TVNC and TVND).

Test statistics for NDC-BTC, NDC-OUNCE, NDD-BTC, NDD-OUNCE, NDD-SHANGAI, TVNC-BTC, TVNC-FTSEMIB, TVNC-OUNCE, TVNC-WTI, TVND-BTC, TVND-FTSEMIB, TVND-OUNCE, TVND-WTI are greater than the critical values with respect to degrees of freedom. For example, the Fourier cointegration test statistic for NDC-BTC (0.4888) is less than the FSHIN critical value of k=2 for 5% significance level (0,276). In this case, H_0 hypothesis is rejected. No relation has been found for the cointegration results in question. Also, according to the results of the F-statistic which shows the significance of the trigonometric coefficients, the F-Statistics values of NDC-OUNCE and NDC-WTI are smaller than the critical values. Therefore, the H_0 hypothesis of F-statistics could not be rejected, and it was concluded that the results were not significant. The F-Statistics values apart from NDC-OUNCE and NDC-WTI are greater than all of the critical values, so the results are meaningful. The results obtained with the F-Statistic are consistent with the results mentioned above, in which case, the results of the Fourier Cointegration test statistics are

reliable. For NDC-OUNCE and NDC-WTI, whose F-statistic values are insignificant, the SHIN cointegration test was applied, and a significant relationship between NDC and OUNCE and insignificant relationship between NDC and WTI has been found.

Table 3

The Fourier Granger causality test results

	Enders Jones Single Frequency			
	Wald Stat.	Asymptotic p-value	Bootstrap p-value	Optimal Frequnecy
lnNDC→lnBTC	6.606	0.010***	0.010**	3
lnNDC→lnCAC40	4.141	0.042**	0.060*	2
lnNDC→lnFTSE100	4.173	0.041**	0.030**	2
lnNDC→lnFTSEMİB	3.998	0.046**	0.060*	2
lnNDC→lnOUNCE	4.613	0.032**	0.030**	2
lnNDC→lnSHANGAI	2.405	0.121	0.150	2
lnNDC→lnVIX	3.265	0.071*	0.090*	2
lnNDC→lnWTI	5.617	0.018**	0.010**	3
lnNDD→lnBTC	3.739	0.053*	0.050*	3
lnNDD→lnCAC40	0.611	0.434	0.420	3
lnNDD→lnFTSE100	0.382	0.536	0.530	3
lnNDD→lnFTSEMIB	0.638	0.424	0.350	3
lnNDD→lnOUNCE	2.604	0.107	0.110	3
lnNDD→lnSHANGAI	1.292	0.256	0.170	3
lnNDD→lnVIX	1.407	0.236	0.200	2
lnNDD→lnWTI	2.479	0.115	0.110	3
lnTVNC→lnBTC	5.577	0.018**	0.000***	3
lnTVNC→lnCAC40	7.142	0.008***	0.000***	2
lnTVNC→lnFTSE100	3.211	0.073*	0.110	3
lnTVNC→lnFTSEMIB	2.219	0.136	0.110	3
lnTVNC→lnOUNCE	4.617	0.032**	0.080*	3
lnTVNC→lnSHANGAI	1.987	0.159	0.100	3
lnTVNC→lnVIX	2.198	0.138	0.070	3
lnTVNC→lnWTI	4.480	0.034**	0.040**	3
lnTVND→lnBTC	4.516	0.034**	0.050*	1
lnTVND→lnCAC40	4.932	0.026**	0.020**	2
lnTVND→lnFTSE100	5.162	0.023**	0.030**	2
lnTVND→lnFTSEMIB	4.792	0.029**	0.050*	2
lnTVND→lnOUNCE	6.069	0.014**	0.020**	2
lnTVND→lnSHANGAI	3.514	0.061*	0.050*	1
lnTVND→lnVIX	3.939	0.047**	0.070*	2
lnTVND→lnWTI	4.160	0.041**	0.060*	1

*→ refers to causality. ***, ** and * represent 1%, 5% and 10% significance levels respectively. In this study, as T (number of samples) > 50, asymptotic p values are used in the analysis.*

According to the asymptotic p-values of the Fourier Granger Causality test given in Table 3, it has been found that there is causality from Number of Daily Cases (NDC) to BTC at 1% significance level, and to CAC40, FTSE100, FTSEMIB, OUNCE, WTI at 5% significance level; from Number of Daily Deaths (NDD) to BTC at 10% significance level; from Total Verified Number of Cases (TVNC) to CAC40 at 1% significance level, and to BTC, OUNCE, WTI at 5% significance level, and to FTSE100 at 10% significance level; and lastly, from Total Number of Verified Deaths (TNVD) to BTC, CAC40, FTSE100, FTSEMIB, OUNCE, VIX, WTI at 5% significance level, and to SHANGAI at 10% significance level.

5. Conclusions

The COVID-19 outbreak, which started in Wuhan, China, caused great panic and impact worldwide. The economic effects of the pandemic. which reached almost the whole world, has become more and more evident day by day. The COVID-19 epidemic caused a large interruption of production in the USA and China, which are seen as the largest economies in the world and competing with each other, as well as other countries, and price changes in oil, gold, cryptocurrencies and many other sectors and areas. The fact that the countries that have a big voice in the world economy are desperate against this threat affects and will continue to affect the whole world. It is a mystery what the effects of COVID-19, which we are currently living in, and do not know exactly what the effects and results will be on the financial markets in the short and long term.

Accordingly, in this study, the effects of COVID-19, which is accepted as a pandemic, on stock markets representing the financial markets, the gold ounce representing the precious metals, the crude oil representing the energy market, and Bitcoin representing the cryptocurrency markets were investigated separately. While performing these analyzes, in determining causal relationships or long-term relationships, the Fourier SHIN Cointegration Test and Ender and Jones Causality Tests were used for the Fourier transformation of the equations. As a result of the analysis, it has been found that the COVID-19 outbreak has a significant long-term effect on stock markets, crude oil representing the oil markets and the fear index, while has no long-term effect on bitcoin representing money markets. As for the short-term effects of COVID-19, it has been found that the

pandemic has an effect on stock markets, crude oil, fear index, and bitcoin.

In light of all these explanations, it has been determined that COVID-19 has both the short and long-term effects on cryptocurrency markets, precious metal markets, the stock indices representing financial markets that will cause price movements.

The most important contribution of this study to the literature is that with a limited data set of the COVID 19 process, stationarity, cointegration, and causality relationships of the Fourier transformations, which is a new method considering the effects of structural shocks (smooth transition) on financial time series is used.

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CONSEQUENCES OF COVID-19 ON THE INTERNATIONAL TRADE IN GOODS AND SERVICES: FORECASTS, DEVELOPMENTS, RESTRICTIONS

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Abstract

The Covid-19 pandemic has created an unprecedented situation, driven by the measures taken by national governments to fight the spread of the disease, through which companies have been temporarily shut down, the movement of people and goods has been restricted, and supply chains have been disrupted. Although in the first part of 2020, there has been a reduction in international trade flows due to the decline in economic activity, there has been an increase in imports and exports of agricultural products, food and beverages for final consumption and medical products. The analysis shows that global trade in services has declined less than trade in goods. An additional factor of stress on international trade has been the export bans and restrictions. Declining production in China, the world's largest supplier of intermediate goods, is likely to affect the economies in many countries.

Keywords: Exports, Imports, Prognoses, Non-tariff Barriers, Changes, Effects.

JEL Classification: F01, F14, F17.

1. Introduction

Covid-19 has brought into the world an unprecedented challenge. The situation we are facing is not "normal", caused by economic causes, but is the result of unprecedented measures taken by national governments for medical reasons in order to stop the

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spread of the disease, by which companies have been temporarily closed (production has been stopped), the movement of people and goods has been restricted, and supply chains have been disrupted. These measures are likely to cause a significant slowdown in national economies and the global economy, through contractions in production levels, household spending, investment and international trade (European Commission, 2020a). In March 2020, the sectors most affected were health, tourism and transport, especially air transport (European Commission, 2020a and 2020b).

The longer the restrictions remain in place, the longer the period of economic damage, and the greater the reduction in permanent capacity. (UNCTAD, 2020a).

On the other hand, there has been an unprecedented worldwide demand for medical products to combat the disease. All countries depend on international trade and global value chains to obtain these products. This is a challenge, given the disruptions in international transport.

2. Forecasts of International Institutions Concerning Trade Developments

The European Commission (2020c) conducted an analysis to estimate the impact of the crisis brought about by Covid-19 on trade flows using the forecasts[1] for 2020 concerning Covid-19 shocks to GDP. The impact of Covid-19 on trade is considered to be the reduction of trade flows due to the decline in economic activity. The estimates in the analysis are subject to a high degree of uncertainty, given that the current crisis is an unprecedented situation, with many unknown variables, including the period of time in which the economy will recover.

The analysis carried out by DG TRADE's economists estimates a 9.7% decrease in world trade in 2020. For EU27, the economic contraction projected as a result of Covid-19 results in a 9.2% reduction in the extra -EU27 exports of goods and services and a 8.8% decrease in non-EU27 imports in 2020.

[1] *The impact on GDP is obtained from the difference between the estimated GDP projections before and after the Covid-19 outbreak. The MIRAGE1 model of computable general equilibrium was used to estimate the effect that the changes in these macroeconomic forecasts will have on trade.*

The General Director of the World Trade Organization (WTO), Roberto Azevedo, said at the press conference from April 8th, 2020, that the pandemic will generate an economic and social crisis, with shocks on the supply and demand (WTO, 2020d).

The WTO has also simulated the potential economic effects of Covid-19 on international trade, using a methodological approach[2] different from that of the European Commission. The WTO has forecast a sharp decline in trade by 2020 in every region of the world and in all economic sectors.

The GDP shocks associated with trade decreases are higher than those used in the European Commission's model. WTO projections estimate that, depending on GDP scenarios, the volume of international trade will fall, in Europe, between 12% and 33% in 2020 (exports by 12% -32%, while imports by 10% -25%), and will increase between 20.5% and 22.7% in 2021. Globally, in 2020, the WTO forecasts a reduction in the volume of international trade by 13% -32%, and an increase of 21% -24% in 2021. Forecasts have been made in conditions of insecurity due to a large number of unknown variables (e.g., the degree of stress of credit markets influences trade financing).

WTO economists estimate a rebound of trade and production to pre-Covid-19 trajectories the earliest in 2021. But there are other scenarios according to which trade volume will not return to pre-Covid19 levels.

According to IMF forecasts released in April 2020, the volume of world trade in goods and services will decrease by 11% in 2020 and will increase by 8.4% in 2021 (IMF, 2020). Imports of advanced economies will be more affected than those of emerging and developing countries (decrease of 11.5% compared to 8.2% in 2020, respectively increase by 7.5% compared to 9.1% in 2021). The same situation exists for exports. Thus, the exports of advanced economies decrease by 12.8%, and those of emerging and developing economies decrease by 9.8% in 2020 and increase by 7.4% compared to 11% in 2021 (IMF, 2020).

[2] *The WTO approach uses consensual GDP estimates (usually obtained from the IMF, the World Bank and the OECD) for different regions, as inputs to the trade forecast model. Due to the lack of very recent forecasts of GDP, the WTO has generated its own forecasts for world GDP, which are based on three possible scenarios (V-shaped, U-shaped and L-shaped recovery), ranging from -4.8. % to -11%, depending on the assumptions regarding the duration and severity of the COVID-19 crisis.*

The IMF has suggested reducing tariff and non-tariff barriers to international trade and global production chains in order to support economic recovery.

According to the Coordinating Committee for Statistical Activities (CCSA, 2020), in UNCTAD studies (UNCTAD, 2020a and 2020b), the price index of free market commodities indicates that global trade values and prices have been negatively affected in the first quarter of 2020 by the emergence of Covid-19. So UNCTAD's forecasts for global trade values indicate a decrease of 3.0% in the first quarter of 2020 compared to the previous quarter. The biggest impact on world trade of the measures taken to stop Covid-19 would occur in the second quarter of the year, with a quarterly decline of 26.9%.

UNCTAD's price index for free market commodities has fallen by 1.2% in January, by 8.5% in February and by 20.4% in March. Fuels have been the main cause of this development, falling by 33.2% in March, while minerals, ores and metals, food and agricultural raw materials have fallen by less than 4%. A monthly decrease of more than 20% has never occurred before, not even in 2008, at the beginning of the global financial crisis, when the maximum monthly decrease was 18.6%.

It is likely to be a more significant reduction in trade in sectors with complex links of value chains, in particular in the electronic products and transport equipment and electrical machinery sectors.

States that rely heavily on exports of energy products, whose demand is little affected by price fluctuations, will have a relatively small estimated decline in exports (Middle East countries and the Commonwealth of Independent States (CIS), including associations and former Member States).

Imports of key raw materials for production may have been significantly reduced due to social distancing, which has led to the temporary closure of factories in China, Europe, and North America.

Trade in services has been directly affected by Covid-19 due to the transport and travel restrictions and to the closure of many hotels, restaurants, etc. Services are not included in the WTO trade forecasts, but much of the trade in goods would be impossible without them (e.g. transport). Unlike goods, services cannot be stored; trade in services not carried out during the pandemic could be lost forever. Also, services are interconnected, the air transport allowing the achievement of an ecosystem of other cultural, sports and recreational activities. However, some services may benefit from the crisis. This is the case

of information technology services, whose demand has increased significantly, as companies try to allow employees to work from home, as well as since people socialize remotely.

3. The Evolution of International Trade in The First Part of 2020

In a globalized economy, the risks to world trade have also increased in recent years. Azevêdo (2020) shows that even before the first case of Covid-19 appeared, the potential of trade to boost economic growth was not fully exploited, so that global trade in goods fell at a significant pace in the last quarter of 2019.

The first effects of Covid-19 were factory closures and supply disruptions in many sectors.

As a result, in March 2020 there was a decrease of 11.9% in world exports of goods and of 12.4% in world imports of goods compared to the same period of the previous year. According to World Bank Group (World Bank, 2020a), the most affected regions by the contraction in trade were the Middle East, North Africa, South Asia, sub-Saharan Africa, and the European Union-27 (12.2% for exports and respectively, 14.2% for imports, per group).

In the case of Romania, in March 2020, exports of goods decreased by 13.1%, and imports by 3.8% compared to the same period of the previous year (NBR, 2020).

On the other hand, in the countries important in world trade (China, EU27, Japan, USA) (as a group) exports of intermediate agricultural goods have increased (by 8.1% on average, annual increase) and imports of intermediate agricultural goods have increased (by 7.1% on average, annual increase). In the case of the same countries, exports of food and beverages for final consumption increased by 2.6% compared to the previous year in March, and imports increased by 11.7% (World Bank, 2020a).

In March 2020, international trade in medical products also boosted, while the trade in transport equipment, goods from the extractive industry and capital goods declined (World Bank, 2020a), reflecting reduced demand and investment. Imports of transport equipment decreased by 10.5% (compared to March 2019), in China, EU 27, Japan and the United States (as a group), and imports of fuel and lubricants (with intermediate level of processing) decreased by 21.9% in March (World Bank, 2020a).

In the case of this group of countries, in March 2020, the most significant contraction occurred for exports of capital goods (12.5%) and less for intermediate goods. Imports fell the most in the case of capital goods (7.4%), and fuels and lubricants, reflecting reductions in oil prices.

Trade in intermediate industrial products remained constant, which shows that the core activities of the global value chains have been relatively resilient. In the case of China, the EU-27, Japan and the United States (as a group), the exports of intermediate industrial products (other than food and beverages, fuel and lubricants and capital intermediate goods) decreased by 3% in March 2020 compared to the previous year, while imports fell by 5.5%.

Global trade in services has declined less than trade in goods. There have been significant decreases in transport services (especially air), travel and tourism, and there have been increases in trade in telecommunications, computer, and information services, which promote the work from distance and online trade.

The study of the World Bank Group (World Bank, 2020b) shows a weak correlation between the number of cases of Covid-19 and the changes in exports and imports in March 2020 (the error coefficient is determined by the differences in reporting and testing standards between countries). It is clear that there has already been a globalization of trade contractions by March. The main determinant of trade contraction is the severity of business, firms' closures, and does not correlate with the severity of the disease, but rather with the way the authorities have introduced quarantine measures and business closures. Variations in imports and exports in an economy depend not only on the severity of Covid-19 in that country, but also on the evolution of the disease in most partner countries, in the context of complex interdependencies between countries.

3.1. Effects on World Trade due to Declining Production in China

In the last two decades, China has become extremely important in the global economy, both due to its status as a producer and exporter of consumer goods, and because it has become the main supplier of intermediate goods to foreign manufacturing companies. At the beginning of the Covid-19 crisis, about 20% of the global trade in intermediate products came from China (up from 4% in 2002).

Therefore, a reduction in China's supply of intermediate goods may affect the production capacity and therefore the exports of any

country, depending on the degree of dependency of that country's industries on Chinese suppliers.

In addition, China's share in some sectors of the world trade exceeds 50% (e.g. 59% in 2018, in world trade of telecommunications equipment). Since 2001, when it joined the WTO, China's importance has grown both in world trade and in production chains. The multinationals took advantage of the opportunities offered by China both in terms of production and of demand for the products obtained.

Many companies around the world fear that the measures introduced in order to prevent the spread of Covid-19 could prevent the supply of important parts from Chinese manufacturers, thus affecting their own production.

UNCTAD (2020a) conducted an analysis meant to identify the most exposed economic sectors and countries to a disruption in China's exports of intermediate goods.

The analysis starts from a series of simplifying premises. Thus, it is assumed that supply disruptions occur only in China. Failures that Covid-19 may directly cause in the production of other countries are not taken into account. The results of the analysis should be interpreted as short-term effects, as supply in the rest of the world is assumed to remain constant.

In addition, the impact of the drop in demand in China caused by an economic slowdown (e.g. the impact on third countries of the reduction in imports of goods into China) is not taken into account.

China's current integration into sectoral global value chains shows that the Chinese production is essential for many global value chains worldwide, especially for those related to precision instruments, machinery, automotive equipment, communication equipment, electrical machinery, plastics, office equipment (UNCTAD, 2020a). Any significant disruption in China's supply in these sectors is considered to substantially affect producers in the rest of the world.

The UNCTAD analysis (UNCTAD, 2020a) shows that in the event of a reduction in Chinese production of intermediate goods, the most affected economies will be the European Union (construction equipment, cars and chemicals), the United States (construction equipment, cars and precision instruments), Japan (construction equipment and cars), the Republic of Korea (cars and communication equipment), Taiwan (communications equipment and office equipment) and Vietnam (communication equipment).

Although there are still uncertainties about the impact of Covid-19 on China's productive capacity, the statistics indicate a significant decline in production in China (in February 2020). The decrease measured by the Manufacturing Procurement Index (strongly correlated with exports) implies a reduction of exports by about 2% on an annual basis. In other words, the decrease noticed in February 2020 is equivalent to a 2% reduction in the supply of intermediate goods.

4. Export Restrictions and Bans: Some Positive and Negative Effects

An additional factor of stress in the international trade has been the (temporary) export bans and restrictions that some countries and separate customs territories (including the European Union) have introduced to alleviate critical shortages of medical supplies at national level. These restrictions apply to medical and pharmaceutical materials, medical equipment, food, toilet paper. As global production of medical materials essential in the fight against Covid-19 has increased, trade has become especially important and the optimal functioning of value chains can help prevent increased costs.

Export restrictions affect integrated supply chains, can create bottlenecks in the production of essential goods by blocking production factors in some states, disrupt logistics and distribution chains, which are based on central warehouses, encourage the build-up of stocks in the supply chain and, finally, may reintroduce internal borders.

Export bans and restrictions imposed by large exporters may lead to a short-term decrease in domestic prices for the goods concerned and may increase domestic supply. But in the long run, exporters can be adversely affected. On the one hand, lower domestic prices will reduce the incentive to produce the good domestically, and the higher external price creates an incentive to smuggle abroad, both of which can reduce the domestic supply of the product.

Export bans and restrictions reduce the global supply of the products in question, with negative effects on countries that cannot produce them. Thus, if a country cannot obtain essential goods for certain and predictably through trade, it can start producing those goods at the national level, even at much higher prices. Such a scenario would probably lead to lower supply and higher prices for much-needed goods, with significant long-term effects.

Given the lack of transparency at the multilateral level, economic operators have to deal with a high degree of uncertainty, as it is not known what measures have been taken by which countries. Insufficient information makes it difficult to adapt purchasing decisions efficiently and find new suppliers. This could be especially harmful for those who want to procure materials needed to fight Covid-19.

Improving transparency requires that measures should be published at national level, passed on to the WTO and to other trading partners.

The discontinuities in distribution chains due to trade restrictions or customs delays, food security, problems in the regions affected by Covid-19 and export restrictions of large exporters are sources of risk for rising food prices.

GATT (General Agreement on Tariffs and Trade) (1994) allows the implementation of export restrictions and prohibitions only if they are temporary and if they are not introduced for the purpose of discriminating certain countries.

Also, the article 35 of the Treaty on the Functioning of the European Union (Treaty of Rome of 1957) prohibits national export restrictions. However, Member States may take justified measures on grounds of "protection of health and life of persons" in accordance with Article 36. Such individual measures must comply with the principle of proportionality, namely to be appropriate, necessary and proportionate for achieving the objective pursued, ensuring an adequate supply for those most in need, but at the same time preventing, throughout the EU, the shortage or aggravation of shortages of basic necessity goods, such as personal protection equipment, medical devices or medicines.

The G20 Ministerial Declaration of 30 March 2020 emphasized that “emergency measures designed to combat Covid-19, if deemed necessary, must be targeted, proportionate, transparent and temporary and must not create unnecessary barriers to trade or disrupt the global chains of supply and they should be in line with WTO rules".

5. Conclusions

Covid-19 has influenced everything: the way we live, interact, work, communicate, move and travel, etc., due to the measures taken by the authorities to prevent the spread of the disease. These measures are likely to cause a significant slowdown in the national

economies and the global economy, through contractions in production, household spending, investment and international trade.

The analysis shows that the impact of Covid-19 on trade is the reduction in trade flows as a result of declining economic activity. The duration and extent of the downward trend of international trade are still unknown.

An additional element of tension on international trade has been the export bans and restrictions.

The global economy is highly dependent on China, as China has become the world's largest supplier of intermediate products. Therefore, it can be assumed that any disruption in China's production will have repercussions in other parts of the world through regional and global value chains.

Maintaining normal trade flows as much as possible during Covid-19 is important for ensuring access to essential food and medical products and for limiting the negative impact on jobs, living standards and economic activity.

Trade in services may be the component of the world trade the most directly affected by Covid-19 due to the transport and travel restrictions and closed hotels, restaurants, etc., and to the fact that services cannot be stored. On the other hand, some services may benefit from the crisis created (information technology services).

The main determinant of the contraction in trade is the severity of business and companies closures, and it does not correlate with the severity of the disease, but rather with the way in which the authorities have implemented quarantine measures and activities' closing. Changes in imports and exports in an economy depend not only on the severity of Covid-19 in that country, but also on the evolution of the disease in most partner countries, in the context of complex interdependencies between countries.

Governments need to keep in mind that economic imbalances are transmitted to trading partners through trade and global value chains.

Given that this economic crisis has completely different causes from previous crises (banks are not undercapitalized, the economy was functioning well before it was shut down), if the right steps are taken to get the economy back running, a quick and vigorous recovery is possible. The way and the ability of the economy to recover depend on the choices of economic policies implemented by governments.

A strong recovery is more likely if policymakers send signals that the disease was a temporary, single economic shock. On the other hand, if the disease is prolonged and / or uncertainty becomes more widespread, households and economic agents are likely to spend more prudently. In addition, the longer the restrictions remain in place, the longer the period of economic damage, and the larger the reduction in permanent capacity. (UNCTAD, 2020b).

For a speedy and vigorous recovery, fiscal, monetary and trade policy measures must converge. The adoption of protectionist measures could introduce new shocks. Keeping markets open to international trade and investment would probably help economies recover faster.

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THE CORRELATION BETWEEN ECONOMIC INDICATORS AND TAIWAN STOCK MARKET - A CASE STUDY OF LEADING AND LAGGING INDICATORS

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Abstract

This study investigates the correlation between economic indicators and Taiwan stock market, analysing the leading and lagging indicators from January 1995 to December 2016 to determine whether there is any significant correlation between the indicators and the stock market. With Large-cap Stock Price Index as dependent variable and the leading and lagging indicators as independent variables, and the correlation between the leading and lagging indicators and Taiwan Stock Exchange Corporation (TSEC) Large-cap are empirically analysed by multiple regression analysis in Eviews 9. It is concluded that there is both a significant and positive correlation between the leading indicator of the Index of Export Orders and the closing price of TSEC Large-cap Stocks and a significant and negative correlation between the lagging indicators of Unemployment Rate and Inventories to Sales Ratio for Manufacturing and TSEC stock price.

Keywords: TSEC Large-cap Index, leading indicators, lagging indicators

JEL Classification: D53, E44, G10.

1. Introduction

1.1. Background and motivations

Investment has become a universal money-making channel, with stocks being the most common and important investment vehicle. If the stock market of a country develops stably, the country's economy

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must be growing steadily. So how to make sound investment decisions? A lot of factors may affect stock trend. As far as long-term trend is concerned, economy plays a key role that influences investment decisions. Therefore, one has to know economic situations well to make financial investment. Economic indicators can reflect the economic climate profile of a country and their variation can serve as references based on which governments prepare financial and economic policies; in light of this, investors have to know the meaning and significance of economic indicators in order to be able to investigate and judge the trend of financial market in the future for the basis of their decision-making in investment. One is apt to make blunder(s) in investment without in-depth understanding of the implication of economic indicators.

In 1997, hi-tech sector replaced traditional industries and financial sector in stock market. Electronics-sector stocks drove the stock market rise in Taiwan--the turnover of electronics-sector stocks took up 80% of the total turnover of Taiwan stocks--and boosted stock market quotation to a new record height. However, the outburst of the Asian Financial Crisis in July 1997 dealt a devastating setback to Taiwan stock market. Thailand was forced to implement floating exchange rate system instead of its original fixed exchange rate system, the resultant abrupt free fall of THP to USE exchange rate and the uncontrolled depreciation of other Asian countries triggered the finance crisis. Taiwan was also caught in a financial turmoil in 1998 due to the impact of the Asian Financial Crisis. TSEC Large-cap Index dropped from 10000 points to 6500 points, a slump of 35%, as a result of the sluggish economy. With economy still not fully recovered, the 921 Earthquake in 1999 and the proposal of Two-State Theory by President Lee Tenghui sent Taiwan stock market to the brink of market crash, and investors' confidence in Taiwan stock market was smashed. Then, TSEC index climbed to 10328 points in 2000, but the burst of the Internet bubbles and the subsequent market crash once again slapped down the market to 5000 odd points. It is thus evident that economic outlook has significant influence on Taiwan stock market. If we can infer the correlation between relevant economic indicators and stock market performance, it is believed that in the future investors' prediction of price trend of the investment market and their invested stocks will be more accurate and their capability of stock trade will be improved.

Liu (2006) on the economic indicator data of 108 months from January 1997 to December 2005 to determine their influence on

Taiwan stock market, this study divides 39 variables into 3 categories, i.e., domestic macroeconomic indicators, supply side indicators and demand side indicators. Domestic macroeconomic performance is judged by Index of Export Orders, Direct Finance, Indirect Finance, Real Money Supply, M1A, M1B and M2, while supply side economic performance is judged by TAIEX, Export Orders, Indexes of Producer's Inventory, Average Monthly Overtime in Industry and Services, Building Permits, Real Imports of Semiconductor Equipment and Crude Oil Inventories, and demand side economic performance by Unemployment Rate. One of the conclusions suggests that "the leading indicators released by Council for Economic Planning and Development are usually predictive and directive, and it seems that business climate has influence on fundamentals of stock market to some extent". From the first half of the sentence, it can be inferred that the leading indicators are predictive of business climate. The leading indicators proposed by National Development Council consist of 7 economic factors and predicts the variation of business climate in the future (see http://index.ndc.gov.tw). The last half of the sentence suggests that there is a correspondence between business cycle and the stock market, the showcase of economy. Both the stock market and the leading indicators are predictive of future variation of business climate.

The 39 variables can be divided into Domestic Macroeconomic Performance, Supply Side Economic Performance and Demand Side Economic Performance according to the orientation of economic performance. This study summarizes leading indicators related and lagging indicators related factors in Table 1 into the following orientations.

Table 1

Categorization of the 39 variables

Domestic Macroeconomic Performance	Supply |Side	Demand Side
Index of Export Orders(leading)	TAIEX (leading)	Unemployment Rate (lagging)
Direct Finance(lagging)	Export Orders(leading)	
Indirect Finance(lagging)	Indexes of Producer's Inventory(leading)	

Domestic Macroeconomic Performance	Supply |Side	Demand Side
Real Money Supply (leading)	Average Monthly Overtime in Industry and Services (leading)	
M1A(leading)	Building Permits(leading)	
M1B(leading)	Real Imports of Semiconductor Equipment (leading)	
M2(leading)	Crude Oil Inventories (leading)	

Data Source: Chang et al. (2016) and this research arrangement.

As can be seen in Table 1, most of the 39 variables are combinations of leading indicators and lagging indicators. There are 7 Domestic Macroeconomic Performance indicators and 7 Supply Side indicators, 1 Demand Side indicators. It is found that 80% of them are leading indicators, meeting the business climate predicting characteristics of the leading indicators perfectly. Taiwan's leading indicators and lagging indicators have either consistent or opposite trend with the stock market. In light of this, this study will use leading indicators and lagging indicators that are representative of Taiwan's economy to explore the correlation between these indicators and TSEC Large-cap.

1.2. Objectives

Of the many business climate and stock market trends predicting methods available, a simple method is to observe business climate indicators. National Development Council selected from many influencing factors of the Taiwan’s economy several ones that most influence the Taiwan's macroeconomics, and divided them into three categories, i.e., Leading Indicators, Lagging Indicators, and Coincident Indicators (see http://index.ndc.gov.tw). The leading indicators are the combinations of 7 business climate variation predictive indicators and one of the important prediction tools for forecasting short-term business climate in the future; the lagging indicators consist of six economic factors which usually lag behind business cycle variations. They have in nature a bias towards the testing of the correctness of the trend of leading and/or coincident indicators. The coincident indicators

consist of 7 indicators which, coinciding with business climate variation, can reflect current business climate.

This study aims to discuss the linkage between the economic indicators and the stock market, and it is hoped that the empirical results can serve as a reference for individual investors and institutional investors in their investment. This study will investigate the leading indicators that can predict business climate and the accuracy of trend prediction with the leading indicators is verified using the lagging indicators. When business climate is overheating or at low tide, the central bank may stabilize the business climate with monetary policy tools including Deposit Reserve Rate, Discount Window, Open Market Operation and Re-deposited Deposits of Financial Institutions, etc. The most frequently used approach is to increase or decrease the circulating money on market by open market operations such as bond trading or issuing fixed term deposit. This approach changes the Real Monetary Aggregates, a leading indicator. It is thus evident that the leading indicators have their significance.

Finally, the coincident indicators represent current business climate. They correspond to business climate reciprocally and cannot reflect business climate trend in advance or in retrospect. Therefore, the coincident indicators are excluded from the independent variables of this study.

1.3. Limitations of the study

There are three limitations, which are described one by one in this section:

(I). This study is to investigate the correlation between Taiwan stock market and economic indicators, which can be divided into Leading Indicators, Coincident Indicators and Lagging Indicators. Coincident indicators coincide with business climate variation, and their turning points usually emerge synchronously with the turning points of business climate cycle. Therefore, they cannot indicate the trend of business climate and are excluded from this study.

(2). Stock Price Index, a leading indicator, is a dependent variable of this study. Therefore, it is excluded from the leading indicators of this study and is not used as an independent variable of the leading indicators of this study.

(3). Multiple regression analysis is carried out in this study. In order to ensure the precision and accuracy of the analysis, 6 variables, i.e., Building Permits and Real Monetary Aggregates (leading

indicators), Regular Employees on Payrolls in Industry & Services, Manufacturing Unit Output Labour Cost Index, Interbank Overnight Call-Loan Rate, Loans and Investments of Monetary Financial Institutions (lagging indicators), are excluded from this study for their collinearity problem.

2. Literature Review

2.1. Correlation between economic indicators and stock indexes

In a world featuring frequent economic trading between countries, all countries' currency exchange rates, policies, and stock markets would influence their national economy. Chang (2005) pointed out that Ganger causality test results suggested that TSEC Index WAS influenced by international stock price indexes. It has been found that Dow-Jones Index, NASDAQ Index, S&P Index, Philadelphia Semiconductor Index, Paris CAC Index, London FT 100 Index, Frankfurt DAX Index, Korea Composite Stock Price Index, Tokyo NIKKEI 225 Index, Hong Kong Hang Seng Index have one-way causal relation with TAIEX, electronic-sector stocks index, finance-sector stocks index, and MSCI Taiwan Closing Index, suggesting that Taiwan's stock price indexes would be influenced by international stock prices. USD to TWD Exchange Rate has one-way causal relation with MSCI Taiwan, i.e., the fluctuation of USD to TWD Exchange Rate would have impact on Taiwan's stock price. It is conjectured that the elevated weight of MSCI Taiwan plus Taiwan government's loosening of restrictions on foreign investment in Taiwan stock market have enlarged the amount of foreign capital invested in Taiwan stock market. As a result, the fluctuation of exchange rate market becomes even more rapid.

Shen (2011) had probed into the influence of US stock market trend on Taiwan stock market. In his study, the complete data of TWSE Taiwan 50 Index were analysed first, then divided into 3 categories, i.e., electronics -sector stocks, finance-sector stocks, and non-electronics non-finance sector stocks. A total of 4 groups of samples were subjected to empirical analysis to determine whether the samples' accumulative abnormal return and normalized accumulative abnormal return are significant within five (5) days after the empirically analysed event. The results showed that a 3% or higher fluctuation of S&P 500 index has positive effect on TWSE Taiwan 50 Index. Whenever S&P 500 index rose by 3% or more, TWSE Taiwan 50 Index would

experience significantly positive accumulative abnormal return one day after the event. On the contrary, whenever S&P 500 indexes dropped by 3% or more, TWSE Taiwan 50 Index would experience significant negative accumulative abnormal return one day after the event. Moreover, when the samples were divided into electronics -sector stocks, finance-sector stocks, and non-electronics non-finance sector stocks for group tests, the empirical results showed most stocks except for finance-sector stocks would experience positive performance identical to those mentioned above. It is thus evident that a 3% or more rise/fall of S&P 500 index indeed has positive influence on the performance of TWSE Taiwan 50 Index on the following day. This finding can serve as a reference for investors in their investment.

The causal relation between U.S. stock market index and TAIEX was then analysed in terms of practicability, expectancy and non-expectancy. Granger causality tests were conducted on 3 U.S. stock market indexes and 3 weighed Taiwan stock market indexes. Whether from the perspective of practicability, expectancy or non-expectancy, we have adequate evidence that Dow-Jones index, S&P500 index and NASDAQ index have powerful one-way influence on weighed Taiwan stock market index, suggesting that Taiwan stock market is a follower of U.S. stock market. U.S. stock market as a leader of international finance has adequate influence and its trend has impact on international financial market. Taiwan is an export-oriented economic entity, and the United States is Taiwan's largest and most important trade partner. Therefore, the fluctuation and trend of U.S. stock market have substantial influence on Taiwan stock market. The study came to an important conclusion that TAIEX treads behind U.S. stock market index and has rational expectation from U.S. stock market index.

Wu (2003) explored the dynamic correlation between the stock markets of Taiwan, the United States and Japan with time-sequence approach. Their empirical analysis revealed that: the long position and short position of the stock price index would complete interaction within a short time, and they do interact with each other, but such interaction is not an all-round one because the OEM relation or correlation between countries would affect the short-term return of stock prices. Furthermore, it is known that there is only one-way causality between the ROIs of stock price indexes of the studies countries. Both Taiwan and Japan are under the influence of the ROI of U.S. stock price. In the meantime, Taiwan's stock price index ROI is affected by the ROI of

Japan's stock price index. The study found no causality with the United States.

In addition to Japan, the study also reviewed literature on the credit rating of Greece. National Policy Foundation (2012) described the burst of credit crisis on November 23, 2009 in Greece, one of the so-called PIIGS states. The crisis triggered devastating falls in European and U.S. stock markets. Taiwan stock market was also caught in and directly impacted by this crisis. Luckily, other capital markets such as bond markets and fund markets were less involved and affected, and therefore continue to operate properly. Furthermore, since Taiwan stock market is a so-called thin market[1], which means most securities transactions in capital market are stock trading and there is neither adequate transactions of bonds/alternative financial instruments for investors to select from nor other special resources like those of financial centres that can accommodate impact. Therefore, Taiwan stock market is susceptible to skyrocketing or crash or drastic market fluctuations. As a result, Taiwan stock market went so far as to suffer from an abrupt and devastating fall of 1,358 points with huge turnover in early August 2011, down 15.6% and breaking the strong points of 1-year MA, 2-year MA and even 5-year MA. After the crash, investors' confidence in the market was extremely low and the market took on a pattern featuring short-term oscillation and mid-term market correction. Moreover, the amount of oversold foreign capital increased rapidly since August 2. Taiwan stock market crashed on August 5 for 3 consecutive days under the influence of foreign markets. In the first week of August, the amount oversold exceeded NTD12.6629 billion, hitting a record of oversold amount of foreign capital within a week in the history of Taiwan stock market.

The policies of countries that are in current commercial intercourses with Taiwan may have impact on Taiwan's domestic stock market. Lee (2013) studied the Quantitative Easing (QE) monetary policy of the United States on the ROIs of electronics-sector stocks, finance-sector stocks and construction-sector stocks in Taiwan stock market by event study. His study covered 1430 entries of daily data from 2007 to 2012. The event days of his event study were the

[1] *Thin Market: An economic term, also referred to as thin economy, used to denote an economic system that has limited territory area and relatively scanty natural resources. A thin market like a shallow plate is susceptible to economic fluctuation when agitated due to its weak economic foundation.*

implementation days of the three QEs of Federal Reserve Board in 2008 (QE1), 2010 (QE2) and 2012 (QE3), respectively. Study procedures: First, the day and occurrence time of the events were determined; then abnormal returns were calculated and subjected to test to see whether they were significantly different from zero; finally, average abnormal returns were tested to determine the extent of the event's influence.

Based on the afore-mentioned content, the study results revealed that: the QE policy was implemented in the United States and the implementation period can be divided into QE1, QE2 and QE3. QE1 was implemented to solve the liquidity problem, which at the time of QE1 was not fully recovered. Taiwan's central bank had raised benchmark interest rate and implemented real estate curbing policy before QE2. This, together with the increase of NTD to USD exchange rate to more than 30, has significant adverse impact on OEMs and the construction sector because the rate of gross margin in these economic sectors was merely 3%. The implementation of QE resulted in the flooding-in of hot money and depreciation of NTD, giving rise to the skyrocketing trend of construction-sector stock index at the end of the Five Cities Election. During the QE3 period, which coincides with the finalization of capital gains tax, investors continuously sold their stocks amid the bullish financial news from both Mainland China and Taiwan, the appreciation of NTD and the soaring fuel price. As a result, the turnover and price of large-cap stocks were adversely impacted. The study finally came to a discovery that QE1, QE2, QE3 shared a common ground--the performance of finance-sector stocks were most excellent during the three periods.

Chang (2015) studies the interaction between interest rate, stock price and macroeconomic indicators and illustrated the long-term and short-term influence of the development of monetary policy and capital market in recent years on the macro-economic development of Taiwan. Samples from January 2002 to September 2014 were collected for this study for the observation of the short-term interactions between macro-economic environment indicators including interest rate and stock price trend, exchange rate, GDP, general exports, overall unemployment rate and production index of industries. Furthermore, the study found that exchange rate, a macroeconomic indicator, has one-way causal relation with stock price in the stock markets of Japan, Thailand and Malaysia. In the markets of Korea and Singapore, however, it was found that stock price is the result of the

causality of exchange rate. It is thus evident that the relation between stock price and macroeconomic indicators varies in different markets.

Lee (2015) studied the impact of Abenomics, which was implemented from 2012 to 2014, on Taiwan stock market by event study. The impact of Abenomics on the stock prices of listed/OTC listed businesses in 5 industry sectors, i.e., electrical machinery, automobile, electronics, plastics, and chemical industry were specifically studied. Three (3) event days of Abenomics were chosen and subjected to event study for providing a basis on which the influence of Japan on the average abnormal returns (AAR) and cumulative average abnormal returns (CAAR) of Taiwan stock market and the direction of such influence can be investigated. The first event day is the day on which Japan announced that it would utilize financial and monetary measures to boost economy; the second event day is the day on which Japan's central bank announced that it would release new finance policies in response to Abenomics; the third event day is the day on which Prime Minister Abe Shinzou published his latest economic measures. His study data included the AARs and CAARs of 1,557 listed or OTC listed Taiwanese companies in the 10 days before/after the studied events.

The results showed that the first event day has positive AARs on all listed or OTC listed companies as a whole; it was also found that first event day has positive AARs on electrical machinery, electronic, and automobile-sector stocks but has negative AARs on plastics-sector stocks and chemical-sector stocks. The second event day has positive AARs and CAARs on all listed or OTC listed companies as a whole and has positive AARs on five major sectors of stocks. The third event day has positive AARs on all listed or OTC listed companies, but its CAARs are negative, and its influence on the five categories of stocks yields positive AARs. All three event days have more or less positive influence on Taiwan stock market, with influence gain on electrical machinery sector stocks being the greatest, and influence gain on plastics-sector stocks and chemical-sector stocks being the smallest.

Tsai (2014) distinguished contraction periods and expansion periods of business climate with regression test to see whether the influence of business climate on the change of monitoring indicator score is consistent with the stock market's trend and the stock sectors' trend. The data used in the study cover a period from January 1984 to December 2012. A total of twenty sector stocks indexes, i.e., TAIEX, food industry, textile fiber, paper making, building materials &

construction, finance & insurance, cement, plastics, electrical machinery, electrical appliances & cables, chemical & biotech, glass & ceramics, rubber, steel, automobile, electronics, shipping, sightseeing, trading and general merchandise, and other sectors. The closing prices and monitoring indicator scores on the last business day of every month were subjected to tests. Her study results revealed that:

(1) There is significant positive correlation between current same-sector stocks index and monitoring indicator score variation.

(2) During contraction period and expansion period, monitoring indicator score variation has significant negative correlation with same-sector stocks index, suggesting that monitoring indicator score variation has poor interpretative force in expansion period for same-sector stocks index. The underlying cause might be that, during expansion period, economy develops prosperously, and the component economic indicators of the monthly released monitoring indicator score are changing rapidly. Therefore, they have poor interpretative force for lagging periods and their response has significantly negative correlation. In stock sectors that have significantly negative correlation with lagging periods, monitoring indicator score variation has insignificant and almost negligible response to the stocks sectors' lagging returns. Therefore, they can be used to distinguish the contraction period or expansion period of business climate but have poor predictive force for the trend of the stock sectors.

2.2. Summary

Taiwan stock market since 1953 to date has experienced a lot of events and has become an important investment vehicle in financial market in spite of its fluctuations. It can be readily inferred from other researchers' papers that Taiwan stock market is influenced not only by Taiwan's political and financial factors but also by volatile foreign factors. Taiwan is an island nation that has close economic links with other countries. A lot of events, may it be the QE policy of the United States or the Abenomics of Japan or the credit crisis of Greece, once impacting the economy of their country of origin would eventually affect Taiwan stock market indirectly more or less. There are numerous studies and papers on how foreign countries' economy would affect Taiwan stock market, however, only a few of these studies and papers are on how Taiwan's economic factors influence the stock market. In

light of this, this study aims to determine how representative economic factors of Taiwan affect Taiwan stock market.

3. Research method

3.1. Data description

Study period: from January 1, 1995 to December 31, 2016. Data Structure: monthly data. Dependent Variable: TSEC Large-cap Index. Data Source: Taiwan Stock Exchange Corporation (TSEC). Independent Variables: Leading Indicators--Index of Export Orders, Net Accession Rate of Employees on Payrolls of Industry and Services and Real Imports of Semiconductor Equipment. Lagging Indicators: Unemployment Rate, Inventories to Sales Ratio for Manufacturing. Data Source: National Development Council. The study period spans 22 years (264 months), long enough to support the empirical conclusions of the study.

3.2 Research model

Lin (2016) investigated the correlation between 7 variables (Customs-Cleared Exports, Sales Value in Manufacturing Industries--Business Turnover, Stock Price Index, Imports of Mechanical and Electrical Machinery, Non-agricultural Employment, Industrial Index) and monitoring indicators. Multiple regression analysis results revealed that 2 variables, i.e., Stock Price Index, Customs-Cleared Exports, have significant positive influence on monitoring indicators, with the influence of Stock Price Index being the most significant. In light of this, multiple regression model is used in this study to investigate the correlation between leading/lagging indicators and Taiwan stock market.

This study investigates the correlation between Taiwan stock market and leading indicators/lagging indicators with an empirical model defined by Formula (1):

$$SI_{i,t} = \beta_0 + \beta_1 EPO_{i,t} + \beta_2 ISE_{i,t} + \beta_3 Sem_{i,t} + \beta_4 Uem_{i,t} + \beta_5 IRM_{i,t} + \varepsilon_t \quad (1)$$

Wherein, $SI_{i,t}$ denotes the closing price i of TSEC Largecap Index in Month t; $EPO_{i,t}$ denotes the Index of Export Orders i in Month t; $ISE_{i,t}$ denotes Net Accession Rate of Employees on Payrolls of Industry and Services i in Month t; $Sem_{i,t}$ denotes Real Imports of Semiconductor Equipment i in Month t; $Uem_{i,t}$ denotes Unemployment Rate i in Month

t; $IRM_{i,t}$ denotes Inventories to Sales Ratio for Manufacturing i in Month t; β_0、β_1、β_2、β_3、β_4、β_5 denote coefficients of independent variables; ε_t denotes the Error Value in Period t

4. Empirical analysis

For this study, the dependent variable is Closing Price of TSEC Large-cap Index, and the independent variables consist of 3 leading indicators, i.e., Index of Export Orders, Net Accession Rate of Employees on Payrolls of Industry and Services, and Real Imports of Semiconductor Equipment, and 2 lagging indicators, i.e., Unemployment Rate, and Inventories to Sales Ratio for Manufacturing. The research data are from Taiwan Stock Exchange Corporation (TSEC) and National Development Council, covering a period from January 1995 to December 2016. The correlation between Taiwan stock market and economic indicators is explored with formula (1) and these monthly data. Details of the empirical analysis are described below.

4.1. Descriptive statistics

Table 2 Descriptive statistics of the dependent variables and independent variables the closing price of Taiwan stock market reached 10066.35 points, its highest position in the study period, in July 1997, amid the economic boom. However, it crashed in the same year due to the Asian Financial Crisis. The closing price of Taiwan stock market fell to 3636.94 points, its lowest position in the study period, in 2001, because of the burst of the Internet bubbles. The average closing price of the stock market in the period from 1995 to date is 7166.11 points, with a standard deviation of 1511.378 points. All independent variables of the study have a positive average value. The maximum standard deviation 35.58555 appeared in Index of Export Orders (EPO), suggesting this index has significant fluctuation. The minimum values of all variables except for Net Accession Rate of Employees on Payrolls of Industry and Services (min. -1.41) are positive values.

Table 2

Descriptive statistics of the dependent variables and independent variables

	Qty.	Mean	SD	Min. Value	Max. Value
SI	264	7166.11	1511.378	3636.94	10066.35
EPO	264	67.98379	35.58555	18.21	145.69
ISE	264	0.0985985	0.360554	-1.41	1.16
Sem	264	0.9815075	0.1801417	0.44	1.46
UEM	264	3.931098	0.9943636	1.38	6.13
IRM	264	67.70731	7.705116	52.48	103.38

Notes: 1. SI: Closing price of TSEC Large-cap; EPO: Index of Export Orders; ISE: Net Accession Rate of Employees on Payrolls of Industry and Services; Sem: Real Imports of Semiconductor Equipment; UEM: Unemployment Rate; IRM: Inventories to Sales Ratio for Manufacturing; 2. Dependant Variable is SI; 3. Monthly data for the study period from January 1995 to December 2016.

4.2. Collinearity

According to Cooper and Schindler (2003), the upper limit for determining collinearity is 0.8, which is more rigorous than the collinearity upper limit (0.95) proposed by Grewal et al. (2004). Therefore, in this study, we use 0.8 as the independent variable for collinearity determination criteria. If the independent variable exceeds 0.8, variance inflation factor (VIF) will be tested to see whether the VIF is significantly greater than 10 or not. If the VIF of an independent variable is greater than10, then it is confirmed that the independent variable has collinearity and will be excluded from the empirical analysis.

In this study, empirical analysis is carried out with Statistical Product and Service Solutions Version 22 (SPSS 22). It is found in the study that 6 independent variables, i.e., the 2 leading indicators of Building Permits and Real Monetary Aggregates and the 4 lagging indicators of Regular Employees on Payrolls in Industry & Services, the Manufacturing Unit Output Labour Cost Index, Interbank Overnight Call-Loan Rate, and Loans and Investments of Monetary Financial Institutions, are co-linear indicators. Therefore, these 6 independent variables are excluded from the study.

The collinearity test results of the independent variables in this study are as shown in Table 3 The maximum collinearity value, seen between Index of Export Orders (EPO) and Unemployment Rate (UEM), is 0.4387 and smaller than 0.8. It is therefore confirmed that

there is no collinearity between the variables and no additional VIF test must be carried out.

Table 3

Collinearity between the leading and lagging indicators

	EPO	ISE	Sem	UEM	IRM
EPO	1.0000				
ISE	0.1829	1.0000			
Sem	-0.0296	0.3050	1.0000		
UEM	0.4387	0.0850	-0.2762	1.0000	
IRM	-0.2458	-0.6824	-0.2627	-0.667	1.0000

Notes: See Table2.

4.3. Empirical analysis

Formula (1) is used in conjunction with SPSS22 for multiple regression analysis of the leading indicators of Real Imports of Semiconductor Equipment, Index of Export Orders, Net Accession Rate of Employees on Payrolls of Industry and Services, and the lagging indicators of Unemployment Rate and Inventories to Sales Ratio for Manufacturing to investigate the correlation between the leading and lagging indicators and TSEC Large-cap. The empirical results are as shown in Table 4.

Table 4

Results of empirical analysis of the correlation between the leading and lagging indicators and TSEC Large-cap

	EPO.	**ISE.**	**SEM.**	**UEM.**	**IRM.**
Coef.	30.30054*** (1.990761)	223.2613 (240.5941)	618.007 (387.1268)	-757.9664*** (73.95211)	-33.07051*** (11.36611)
R-Squared	0.5611	0.5611	0.5611	0.5611	0.5611
Observations	264	264	264	264	264

*Notes: 1. See Table2; 2. The dependent variable is TSEC Large-cap; *, **, *** represent the 10%, 5% and 1% significant levels, respectively.*

Of the leading indicators, the Index of Export Orders is significantly and positively correlated with Closing Price of TSEC Large-cap Stocks, while the influence of both the Net Accession Rate of Employees on Payrolls of Industry and Services and the Real Imports of Semiconductor Equipment on the Closing Price of TSEC Large-cap Stocks is insignificant. As for the lagging indicators, both the Unemployment Rate and the Inventories to Sales Ratio for

Manufacturing are significantly and negatively correlated to Taiwan stock price.

All of the above three significant variables have either positive or negative influence on the development of TSEC Large-cap. Booming export sales, low Inventories to Sales Ratio for Manufacturing, low Unemployment Rate, and stable National Income contribute to surplus money for consumption and investment, which naturally lead to prosperous consumption and investment markets. Otherwise, consumption and investment markets are sluggish, and overall consumption expenditure and economic prosperity are adversely affected.

5. Conclusion and managerial implications

As their name suggests, leading indicators have turning points emerging ahead of the turning points of business climate cycle. Of the leading indicators in this study, the Index of Export Orders is an important indicator of exports and business climate. Taiwan is an island nation lack of lands and natural resources. Many goods and materials from articles for daily use to industrial raw materials have to be imported from abroad. Autarky is impossible for Taiwan, a densely populated nation that has limited land, therefore the importance of export trade is self-evident. According to the Department of Statistics, Ministry of Economic Affairs (2017), Export Orders is an indicator prepared in accordance with the purchase orders taken by domestic manufacturers from foreign customers, covering raw materials, electronic parts, and semi-finished products. Index of Export Orders is an indicator of export trade prepared on the basis of monthly order variations. Taiwan's domestic business climate is susceptible to the influence of the trade with other countries and as a result other countries' development, policies, and economy will have impact on Taiwan. According to the empirical analysis results of this study, Index of Export Orders has very significant influence on the Closing Price of Taiwan Large-cap Stocks, and the Stock Price Index itself is a leading indicator of economy. In light of the definition of leading indicators of economy, a booming stock market is predictive of future business boom. An article on Financial Times[2] pointed out that the fluctuation patterns of Taiwan's Export Orders, Taiwan's Electronics Export and

[2] *White, E. (2017) "Charts of the year: Taiwan - Apple nation". Financial Times, 13 December.*

Apple's stock price are similar to each other to some extent. Therefore, our empirical analysis results suggest that Index of Export Orders may provide a strategic investment indicator to investors for their reference in stock market investment.

Index of Export Orders heralds business climate and relates to Inventories to Sales Ratio for Manufacturing. The demand shrinkage following the 2008 financial tsunami had at one time in the year 2009 sent the Inventories to Sales Ratio up to more than 90%. The sluggish business climate had once resulted in an unemployment rate higher than 5%, which is the peak value in recent years. The average of the Stock Price Index in the period from1995 to 2016 is 7166.11. The averages for 2008 and 2009 are 6940.07 and 6487.86, respectively, both are lower than the average for the study period. This echoes with an empirical analysis result of this study that Unemployment Rate and Inventories to Sales Ratio for Manufacturing are negatively correlated with stock price.

Unemployment Rate is categorized as a lagging indicator; however, unemployment has significant and immediate effect on those who want to make investment. When it is impossible to broaden sources of income, one has to reduce expenditure. This applies to investors and ordinary people alike. When they are deprived of financial resources, their consumption desire and confidence would decrease, and they would prefer saving moneys over making investment. In contrast, when unemployment rate goes down and people can find a job, they would be more readily to make investment and would be more optimistic towards future.

Business climate is the sum of all industries and indicators, which means a slight move in one part may affect the whole situation (Lupu,2018). This study reveals that the fluctuation of business climate in stock market is by no means the result of a single factor. For an economic entity that has high dependence on foreign trade, the influence of other countries should never be underestimated. Warren Buffett once said, "Risk comes from not knowing what you're doing." This study shows that Index of Export Orders is positively correlated and Unemployment Rate and Inventories to Sales Ratio are negatively correlated with stock market. All these three indicators are highly correlated with Large-cap Index. On the other hand, the ups and downs of stock market also affect business climate. It is hoped that the empirical results of this study can provide individual investors and institutional investors with a strategic reference in their investment. A

high Index of Export Orders can reduce Inventories to Sales Ratio for Manufacturing and improve business climate for lowering Unemployment Rate. The Executive Yuan (2016) in its investment expansion program pointed out that one reason that contributes to the slowdown of Taiwan's economic growth is the sluggish exports. This argument echoes with our study results without prior consultation. Investors are advised to take these three indicators into their investment decision-making for a perfect decision.

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PERFORMANCE OF FISCAL MEASURES IN RECTIFYING FISCAL IMBALANCES IN SAUDI ARABIA

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Abstract

This paper aims to assess the fiscal measures performance in Saudi Arabia initiated in 2016 and onwards in improving fiscal imbalances during the pre-reform period (2012-2015) and post-reform period (2016-2019). In this research, t-Test paired two samples for means has been used to determine the pre- and post-fiscal reform performance. The study finds that there is a significant difference in real gross domestic product, Debt-gross domestic product ratio and Central Government net financial assets over the two periods while fiscal deficit, current account deficit, oil prices and non-oil gross domestic product growth shows no significant difference over the two periods. Therefore, Saudi Arabian policymakers should take extensive steps to finance its budget deficit and should implement suitable policies that accelerate non-oil gross domestic product growth and meet the needs of citizens. The outcome of this research can be used in future research to perceive the impact of Vision 2030 on the Saudi economy.

Keywords: Fiscal Reforms, Fiscal Deficit, Oil Prices, Real-GDP Growth, Saudi Arabia.

JEL Classification: E62, H62, H63.

1. Introduction

Before 2014, Saudi Arabia had reaped the benefits of sustained periods of fiscal and external surpluses which help escalate macroeconomic stability. In 2014, the widening gap between the revenue and expenditures of the government caused a growing high

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fiscal deficit, i.e. -3.4% of GDP. The government's additional decline in net financial position increased borrowing from domestic and external sources, and a decline in oil prices severely worsened macroeconomic problems. This motivated the government to initiate several fiscal and economic reforms to accelerate the economic transformation and ensure sustainability by achieving economic growth and maintaining low-budget deficit ratios.

These issues together worsened international reliance on the Saudi economy. In response, Saudi Arabia launched Vision 2030 on 25th April 2016, which described a journey for a deep and ambitious socio-economic change in the kingdom and took several fiscal reforms aimed at accelerating economic transformation and ensuring fiscal sustainability through achieving economic growth and a narrow fiscal deficit. Thereafter, according to Fiscal Balance Program Report (2017), the National Transformation Program also announced, which commits to strengthening financial governance, increasing non-oil revenues and improving government spending on projects and programs. In late 2016, as a part of wider fiscal reforms like rationalization of government expenditure, restructuring government wages through revising the eligibility and feasibility of various allowances, reform in energy prices, initiative to increase non-oil revenues, and sustaining economic growth in the private sector, the Government commenced the fiscal balance program (FBP) with the main objective of achieving fiscal balance by 2020 (Fiscal Balance Program, 2017). The influence of these in inflating the non-oil revenue will continue to be seen in 2020 and the coming years.

This working research paper aims to assess fiscal reforms performance in Saudi Arabia initiated in 2016 and onwards in rectifying fiscal imbalances during the pre- and post-reform period. To assess these reforms performance, variables like Fiscal Deficit, Real GDP growth, Non-Oil GDP growth, Oil prices (US $ Per Barrel), Debt GDP ratio, Central Government net financial assets (as a percent of GDP), and Current account balance (as a percent of GDP) have been selected by the researcher. Based on these variables, the researcher can assess the performance of fiscal measures.

2. Literature Review

In this portion, studies focusing on the success of fiscal reforms in Saudi Arabia are briefly reviewed.

The implementation of Saudi Arabia's fiscal policy is undergoing significant changes, but reforms need to be further deepened and fiscal consolidation built into a framework that reduces the fiscal policy reliance on volatile oil revenues and makes medium-term fiscal objectives clearer. The important question is whether the introduction of a fiscal rule, as in some other resource-rich countries, will help with fiscal governance in Saudi Arabia (IMF, 2018a).

Algahtani (2016) examined the impact of oil price shocks on Saudi economic activity using annual data on all the oil price shocks from 1970 to 2015, particularly the fall in oil prices in the middle of 2014. To investigate the long-term and short-term relationships between variables, the vector autoregressive (VAR) and vector error-correction model (VECM) were used. The findings indicate a positive and important long-term relationship between oil prices and Saudi Arabia's GDP. Further, Young (2017) suggested that Saudi Arabia's fiscal governance choices will be tested based on its ability to meet the needs of citizens and generate economic growth, particularly its creativity and allocation efficiency.

An analysis by IMF (2015b) makes it clear that oil prices are key determinants of Saudi Arabia's macroeconomic outcome. Substantial fiscal buffer can be used in the near term to smooth out the impact of lower oil prices. Substantial fiscal buffer implies that there is no need for a knee-jerk reduction in fiscal spending; a medium-term fiscal consolidation plan and incremental changes are required. This will allow the government to continue focusing on key development priorities while reducing the medium-term fiscal risks that would build if spending does not adjust to lower oil prices over time.

IMF (2016) selected the "Issues" paper which discussed options for financing the government's fiscal deficit in Saudi Arabia. The Government of Saudi Arabia is working to develop a comprehensive strategy for meeting its budget financing needs. While external borrowing could alleviate domestic market pressures, it will also lead to new risks. Reliance on foreign investors may help to increase transparency.

IMF (2017) discusses Saudi Arabia's launch of a bold Vision 2030 reform agenda. The current reform momentum is strong and the reform implementation is making good progress. Under the OPEC+ agreement, Saudi Arabia has its cut oil production. Non-oil growth is expected to pick up this year, but the overall GDP growth will be close to zero given the decline in oil production. Growth is expected to

strengthen over the medium-term as structural reforms are implemented.

IMF (2018a) suggests that while the government should continue to work on a clear definition of its fiscal policy objectives, at this stage, the focus of the reforms should be to continue to strengthen the fiscal framework rather than introduce a formal fiscal rule. The fiscal law is just as strong as the institutions that support it. Moreover, the experience of resource-rich countries with fiscal rules has been varied, as it has proved difficult to formulate rules that are simple, flexible, and robust and that can withstand large fluctuations in commodity prices.

The IMF (2018b) paper discussed the momentum of reform remaining strong under Vision 2030. New reform initiatives are underway under the Vision Realization Programs (VRPs). Oil prices have risen over the past year and are having a positive impact on fiscal and external balances. However, higher oil prices are both an opportunity and a risk for fiscal reform.

The reforms discussed by the IMF (2019) have started to produce positive results. Oil prices and production have been volatile, and uncertainties remain in the global oil market. Promoting non-oil development and creating employment for Saudi people remain a key challenge.

3. Methodology

Relevant data collected for this study are time series data and has been obtained from the Saudi Arabian Monetary Agency (SAMA) annual reports, and IMF country reports.

In order to assess the performance of the fiscal measures in Saudi Arabia initiated in 2016 and onwards in rectifying fiscal imbalances during the pre-reform period and post-reform period variables like Fiscal Deficit, Real GDP growth, Non-Oil GDP growth, Oil prices (US $ Per Barrel), Debt GDP ratio, Central Government net financial assets (as a percent of GDP), and Current account balance (as a percent of GDP) have been selected by the researcher.

For dealing with these variables paper covers two periods: Pre reform period (2012-2015) and post reform period (2016-2019).

In this study, t-Test paired two samples for means has been used to check whether there is any significant difference in the value of selected variables between two periods.

The following are the hypothesis(s) of the study:

The null hypothesis (H0): *There is no significant difference in the selected value of variables between the two periods.*

The alternative hypothesis (H1): *There is a significant difference in the selected value of variables between the two periods.*

4. Result and Discussion

Table 1

Results of Paired Samples t-Test

Variables	Mean		Std. Deviation		t-Test	sig. (2 tailed)
	Pre	Post	Pre	Post		
Fiscal Deficit	-0.35	-9.45	12.08	5.50	1.061	0.367
Oil Prices	90.2	48.02	27.16	4.35	2.88	0.063
Non-Oil GDP Growth	4.97	1.62	1.35	1.15	2.84	0.065
Real GDP Growth	3.97	1.27	1.12	1.33	5.24	0.013
Debt-GDP Ratio	3.13	18.10	1.87	4.12	-8.69	0.003
CGNFA*	40.96	4.43	3.83	10.41	10.43	0.002
Current Account Balance	10.40	3.45	13.76	5.73	0.759	0.503

**Central Government Net Financial*
Source: Author Compilation, Assets.

The result of the paired sample t-Test analysis revealed that the fiscal deficit has not changed significantly over the two periods. Since p-value (0.367) is more than 0.05 (5 percent), the null hypothesis is accepted. In 2012, the fiscal surplus in Saudi Arabia, it was found, reached 12%, which is reinforced by high oil prices and oil revenues to the government budget (Fiscal Balance Program Report, 2017). However, between 2014 and 2016, oil prices dropped significantly and in 2015, the Saudi government revealed the highest deficit in its budget. The Saudi government implemented a few fiscal consolidation measures, such as VAT, excises, dependent fees, and energy & water price reform to reduce the fiscal burden on the government. The impact of these measures narrowed the fiscal deficit from 17.2% of the GDP in 2016 to 4.7% of the GDP in 2019.

There is no significant difference in oil prices over the two periods, as shown in Table 1. Since the p-value (0.063) is more than 0.05, the null hypothesis is accepted. It is found that the mean of oil prices pre-reform was higher i.e 90.22$ per barrel in comparison to post-reform periods i.e 48.02$ per barrel. During 2012-13, high oil

prices and increased oil production resulted in a large increase in oil revenue and fiscal surplus while declining the Government debt to 3.5% of the GDP. According to the IMF Report (2015a), in 2014, the global oil market environment changed substantially with nearly a 50% drop in oil prices. This is partly due to decline in demand, but more importantly by supply factors. Since the mid of 2017, the moderate rise in oil prices has alleviated fiscal pressure and has increased the importance of structural reforms to transfer the focus from the growth of the public sector growth to the growth of the private sector.

The mean value of real GDP in the pre-reform period is more than the mean value in the post-reform period. As per the result of the paired t-test, the p-value (0.013) is less than 0.05. Therefore, an alternative hypothesis is accepted. Real GDP growth was vigorous during 2012-15 but relatively slow compared to the growth seen in 2011-12 due to a decline in oil production and public sector GDP growth. It is found that real GDP growth recovered to 2.2% in 2018 after contracting in 2017 (-0.07) and is expected to recover more in the coming years.

The analysis of non-oil real GDP shows that there is no significant difference in real non-oil GDP growth over the two periods. The calculated result in Table 1 reveals that the p-value (0.065) is more than 0.05, therefore, the null hypothesis is accepted. The mean value of non-oil GDP growth in the pre-reform is greater than the mean value in the post-reform period. According to IMF Staff estimation (2017), the rate of non-oil GDP growth has slowed, and it nearly reached zero in 2016 which opened up an output gap of -3.4, since the fall in oil prices in 2014. It is found that real non-oil GDP growth ascended from 2.1% in 2018 to 2.9 % in 2019 without being affected by higher electricity prices, dependent tax and levied VAT. It is anticipated that this growth will continue to rise in the coming years since raising non-oil GDP growth is one of the key objectives of Vision 2030.

The analysis of the debt-GDP ratio indicates that the debt–GDP ratio in the post-reform period (m = 18.1) is greater than the pre-reform period (m = 3.13). Since the p-value (0.003) is less than 0.05, an alternative hypothesis is accepted. There has been a continuous rise in the debt-GDP ratio during the post-reform period and is expected to increase further in the coming years. However, Saudi Arabia still has the lowest world debt.

The analysis of the CGNFA reveals that there is a significant difference in CGNFA over the two periods, as shown in Table 1. Since

the p-value (0.002) is less than 0.05, an alternative hypothesis is accepted. The mean value of CGNFA in the pre-reform period is more than that of the post-reform period. This indicates that during 2016-19, the net financial asset position of the government deteriorated due to the continuous increase in gross debt (Percent of GDP) and a decline in central government deposits at SAMA.

The calculated result in Table 1 reveals that the p-value (0.503) is greater than 0.05, therefore the null hypothesis is accepted. The mean value of the current account balance during 2012-2015 (pre-reform), is greater than that of 2016-2019 (post-reform). This indicates that the current balance as a percent of GDP before the reforms was higher in comparison to the post reforms period. According to the IMF Report (2019), the current account balance is projected to narrow from 9.2% of GDP in 2018 to 6.9% of GDP in 2019 as oil export revenues moderate and import growth increases.

5. Conclusion

For assessment of fiscal measures, the variables such as fiscal deficit, real GDP growth, non-oil GDP growth, oil prices, debt GDP ratio, central government net financial asset, and current account balance have been observed. The study has considered the two periods: Pre reform period and post reform period. This study shows a significant difference in real GDP growth, Debt-GDP ratio and Central Government net financial assets over the two periods. It shows that there has been an effective influence of fiscal reforms on real-GDP growth. There has been a decline in net financial asset position of the government during post reform period due to the continual increase in gross debt (Percent of GDP). However, Saudi Arabia still has the lowest world debt. The study shows that fiscal deficit has not changed substantially due to the fall in oil prices. The analysis indicates that the balance of the current account has declined due to a decline in net exports. The study shows that pre-reform growth of non-oil GDP was higher than post-reform growth. To conclude, this study is restricted to only eight years.

However, reforms in the kingdom are a long and complicated path. These reforms would enable the Kingdom to stimulate non-oil GDP growth and, in the long run, to improve its fiscal position. Nonetheless, global oil price volatility will pose a risk of instability in the region. Hence, Saudi Arabian policymakers should take extensive

steps to finance its budget deficit and should implement suitable policies that accelerate non-oil gross domestic product growth and meet the needs of citizens. The outcome of this research can be used in future research to perceive the impact of Vision 2030 on the Saudi economy.

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ASSESSMENT OF THE SHADOW ECONOMY IN THE REPUBLIC OF MOLDOVA: THEORETICAL GROUNDING AND PRACTICAL RESULTS OF THE INPUT-OUTPUT MODEL

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Abstract

Assessment of the phenomenon of shadow economy represents an actual challenge for researchers from all over the world. The current paper aims to make a theoretical grounding and assessment of the shadow economy in the Republic of Moldova. Research is based on the use of the input-output model, which, through its evaluation function estimates the main macroeconomic indicators and allows assessing the shadow economy. The research is based on the analysis of 18 official documents provided by the National Bureau of Statistics of the Republic of Moldova, the Customs Service of the Republic of Moldova, the State Tax Service of the Republic of Moldova, the National Agency for Regulation in Energy, etc. The main findings present considerable losses of the state budget in 2018 (3.02% of GDP), while the agro-industrial complex registering the highest detected values of the shadow economy.

Keywords: Shadow economy, Input-Output model, Republic of Moldova.

JEL Classification: O17, H26, C67.

1. Introduction

The shadow economy represents an actual and acute threat to the national economy of any country, as well for the development of the whole world. Therefore, it is becoming increasingly important to study this phenomenon by measuring its effects on the national economies. Assessment of the shadow economy represents a

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challenge for different scholars from different countries. The researchers have developed a number of methods when trying to evaluate the shadow economy as accurately as possible, but an unanimously accepted evaluation methodology has not been identified yet.

The paper aims to make an assessment of the shadow economy in the Republic of Moldova, based on the input-output measurement approach. The input-output model, which is part of the indirect evaluation methods category, represents one of the applied scientific methods for studying the phenomenon of the shadow economy. The given model represents the balance and flows of products, services and their costs as well as the interdependence between different branches of the industry. The balance of interdependencies between the branches can be drawn up both in natural values and in monetary ones. At the macroeconomic level, it can describe the flow of goods and services, as well as their costs, among all sectors of a national economy over a specific period of time, usually a year.

2. Literature review

In the Republic of Moldova, the input-output model has been used as a research method by various scholars, like: Filip and Silvestru (2010), Naval and Ghereg (2017), Gaftea (2013), Ustian (2015). Taking into account its various functions, the method was used for general analysis of the economy of the country, approaching issues related to the balanced functioning of the economy. In the current conditions of the Republic of Moldova, the phenomenon of shadow economy has been studied by such researchers as: Costandachi (2012), Budianschi et al. (2014), Gutium and Ganciucova (2018), Ganciucova et al. (2016) and others. The author also has a specific contribution in researching the phenomenon of shadow economy in the Republic of Moldova, through the research activity carried out in the framework of the institutional project dedicated to analysis and forecast of macroeconomic indicators in the Republic of Moldova, by a direct contribution to the annual scientific report.

However, there is still no unambiguously acceptable method of assessment of the shadowy economy related to the country's realities.

3. Research methodology

3.1. The input-output model

This model originates in 1898, when Russian economist V.K. Dmitriev, in his paper "Economic Essays"[1], first developed a system of linear equations that linked the prices of goods and the costs of their production, that is, the prices of goods and resources. Proving the solvency of this system of equations, he introduced a series of technical coefficients that show the share of costs of one product in the production of another. In 1924, the Central Statistical Administration prepared for the first time in history a national economy balance for the period 1923–1924 and a forecast balance for the years 1924–1925 (Popov, 1993).

American economist of Russian origin V.V. Leontief, studying the above-mentioned work, carried out a series of researches dedicated to the theoretical foundations of inter-branch balance and concluded that the coefficients that express the connections between the sectors of the economy are quite stable, can be predicted and can be used in economic planning (Leontief, 1925). In the following years, the model was further developed by the scholar and was subsequently used in the analysis of economies of other countries such as USA, Germany, etc. Given the importance of the model for the economy, in 1973 Leontief received the Nobel Prize in economics for developing the "input-output" model and for its applicability in solving important economic problems.

The input-output model found its application immediately after its launch. In Romania, the first Input-Output Table was prepared in 1990. In 1991, Russian Federation implemented the System of National Accounts, and in accordance with the concept of this system, the first input-output balance was drawn up in 1995. Other countries where the model has been developed were USA (1939), France (1950s), United Kingdom (1991), Japan (1995), New Zealand (1953). In 1995, OECD lays the foundation for a project for the elaboration of an input-output table on a global level by grouping 10 countries, over a historical period covering the years 1968-1990. Over the years, the global database of resources and uses (World Input-output database) has been updated, so that in 2016 it included the table of resources-

[1] *V. K. Dmitriev, "Economic Essays on Value: Competition and Utility", Cambridge University Press (1974).*

uses for 43 countries of the world, including most of the countries from the European continent. (World Input-Output Database, 2016).

The specialized literature admits 4 functions of the model:

- *The statistical function* allows the integration of the statistical data in a concise framework, with the possibility of verifying the coherence of the economic information describing the inputs and outputs of goods and services.

- Through the analytical function, consumption ratios in the production process, distribution of the production-by-production branches, as well as the share of final consumption in the total global production can be analyzed.

- The essence of the *evaluation function* is the estimation of the main macroeconomic indicators and the evaluation of the shadow economy.

- Using the model, through the *forecast function*, the main macroeconomic aggregates can be predicted, thus being elaborated economic development scenarios, and anticipated the consequences of modifying different internal and external factors on the demand.

In the general scheme of the input-output model, four components can be highlighted, called quadrants (Table 1).

Table 1

Quadrants of the input-output model

	Intermediate consumption	**Final consumption**
Intermediate product	I	II
Gross value added, import, net taxes	III	IV

Source: Leontief (1925)

First quadrant represents the square matrix of the intra-branch flows of production and expresses the intermediate consumption on various products of the branches of the national economy. The columns of the first quadrant reflect the costs of production of products and services for each industry (cost of raw materials, materials, fuel, energy, services), and the rows indicate the use of products and services for intermediate consumption (production) in the economic sectors. Second quadrant contains the information about the structure of the final used product, by which is understood the sum of the non-productive consumption, of investments, economies of goods, export.

Third quadrant includes the sources of use of the factors of production (capital and labor) for the creation of the gross added value, import on each branch and the net taxes of products and import. The columns of quadrants I and III, which provide us with information on the intermediate product and the added value, reflect the entries. The rows of quadrants I and II provide information on intermediate and final consumption, thus characterizing the use of resources, respectively, outputs (Ganciucov, 2006).

As a result, given that the resources are equal to uses, there is an equality between the sum of quadrants I with III and the sum of quadrants I with II, which can be expressed by the following formula:

$$Q_{pb} + M + T - S = CI + CF + F + V + E \quad (1)$$

where:
Q_{pb} – production volume at basic prices;
M – import of goods and services;
T – indirect taxes on products and imports;
S – subsidies on products and imports;
CI – intermediate consumption;
CF – final consumption;
F – gross fixed capital formation;
V – variation of stocks;
E – export of goods and services.

Indirect taxes on products and imports include Value Added Tax (VAT), excise duties, customs duty, etc.

If we move the intermediate consumption to the left, we obtain the equality (3):

$$(Q - CI) + M + T - S = CF + F + V + E \quad (2)$$

$$VAB + M + T - S = C + G + F + V + E \quad (3)$$

where:
VAB – gross added value;
C – final consumption of households;
G – final consumption of public administration and non-profit institutions serving the households.

The left side of equality (3) expresses the elements of third quadrant, and the right part – the elements of second quadrant, that is the final total demand D_i

$$D = C + G + F + V + E \quad (4)$$

The main elements of the model at the macroeconomic level, used for a simplified economy, conventionally structured by branches, are presented in Table 2. The respective model creates the possibility of evaluating the efficiency of the macroeconomic policies.

Table 2

Input-output model (at the macroeconomic level)

	Intermediate consumption on branch *j*				**Final consumption**						***Yi* Total uses**
Intermediate product on branch *i*:	1	2	...	n	C_i	G_i	F_i	V_i	E_i	D_i Final total demand	
1	x_{11}	x_{12}	...	x_{1n}	C_1	G_1	F_1	V_1	E_1	D_1	Y_1
2	x_{21}	x_{22}	...	x_{2n}	C_2	G_2	F_2	V_2	E_2	D_2	Y_2
...	...	...	...	...	...	...	...	...	...	...	...
n	x_{n1}	x_{n2}	...	x_{nn}	C_n	G_n	F_n	V_n	E_n	D_n	Y_n
Gross added value *VABj*	VAB_1	VAB_2	...	VAB_n	Quadrant IV						
Import *Mj*	M_1	M_2	...	M_n							
Taxes on products and imports *Tj*	T_1	T_2	...	T_n							
Subsidies on products and imports (-) S_j	S_1	S_2	...	S_n							
Total quadrant III Z_j	Z_1	Z_2	...	Z_n							
Total resources Y_j	Y_1	Y_2	...	Y_n							

Source: Leontief (1925)

Since the products from each branch are used for both intermediate and final consumption, we obtain the following formula:

$$Y_i = X_i + D_i \quad (5)$$

or

$$Y_i = \sum_{j=1}^{n} x_{ij} + D_i \quad (6)$$

where:

X_i or $\sum_{j=1}^{n} x_{ij}$ – inter-branch consumption for product *i*;

D_i – final total demand for product *i*.

$$X_i = \sum_{j=1}^{n} a_{ij} \times Q_j \times P_i \quad (7)$$

because

$$x_{ij} = a_{ij} \times Q_j \times P_i \quad (8)$$

where:

a_{ij} – technical coefficient of the consumption of the product *i* when manufacturing the product "j";
Q_j – volume of production *j* in natural expression.
P_i – weighted average price based on the production and import of the product "i".

By generalizing the above-mentioned formulas, we obtain the following formula, which reflects the sum of quadrants I and II, that is, the total uses:

$$Y_i = \sum_{j=1}^{n} a_{ij} \times Q_j \times P_i + C_i + G_i + F_i + V_i + E_i \quad (9)$$

The total resources (sum of quadrants I and III) can be calculated using the following formula:

$$Y_j = \sum_{i=1}^{n} a_{ij} \times Q_i \times P_j + VAB_j + M_j + T_j - S_j \quad (10)$$

The Leontief model explains the scheme for the production of the final demand product in an economy: for consumption, investment and export. The respective model makes a compromise between simplicity and the efficiency of reflecting the economic processes that take place, thus being a convenient, useful and practical tool.

The following basic assumptions regarding the properties of the economic system are used in the construction of the input-output model:

1. An economic system is composed of a series of determined economic elements – branches. Each branch is characterized by a numerical indicator, denoting the overall internal volume of production, expressed naturally or in value.
2. For the production of a given volume of production each branch uses strictly determined quantities of the production of other branches of the same system.
3. Increasing the volume of production per branch requires the proportional increase of all consumption elements included in the production technological scheme.
4. The production provided by each branch is partially used in the production process of other branches, and what remains, goes outside the production system as a final product.

Double registration ensures the equality between the gross output of each branch and the gross input for the respective branch. Therefore, the input-output model allows an accurate detection of the origin of the inputs (resources) and the destination of the outputs (uses), which makes it possible to estimate the shadow economy.

3.2. The input-output model adapted to the conditions of the economy of the Republic of Moldova

The input-output model of V. Leontief can be adapted to the conditions of the economy of the Republic of Moldova, being in accordance with the System of National Accounts. The available statistical data allow the elaboration and use of the input-output model in the evaluation of the shadow economy. The use of this model, unlike other methods of estimating the shadow economy (questionnaire, for example), does not imply the use of additional financial resources, being based exclusively on the analysis of the data provided by the competent bodies. At the same time, a limitation of this method is

represented by the possibility that the provided statistical data may not be of the best quality or the degree of their aggregation is quite high.

Thus, based on the available data, the input-output model for the Republic of Moldova takes the form of a table, comprising several specific interdependent elements. The natural input-output model looks as in Table 3 (see the Appendix).

At the same time, in addition to the table of natural input-output model, it is necessary to elaborate the table of natural-value input-output model, which schematically is displayed in Table 4 (see the Appendix).

This model is required periodically to be adapted, and the technical coefficients need to be revised, stemming from the fact that new technologies are emerging in the national economy, as well as due to manufacturers' tendencies to minimize costs, replacing some types of raw materials with less expensive ones, even to the detriment of the final consumer.

For example, in the Republic of Moldova, mineral wool is no longer produced and no longer used, but at the same time, new materials such as gypsum mixtures are produced and used frequently in this area. Coconut butter is used when making pastry and confectionery instead of butter. When making garments, manufacturers prefer to use synthetic fabrics or with insignificant yarn content.

Although this model involves a large volume of work (data entry for each branch, group of goods or even strategic economic asset such as fuel, calculation of different technological coefficients or different taxes, permanent updating of excise duties or other tax processes for each good, performing an analysis for each branch) it can be considerably simplified using widespread software Microsoft Excel.

4. Results

For elaborating the analysis based on input-output model, a set of official documents (18) have been used, provided by the National Bureau of Statistics of the Republic of Moldova, the Customs Service of the Republic of Moldova, the State Tax Service of the Republic of Moldova, the National Agency for Regulation in Energy, etc. Year 2018 has been examined in order to increase the relevance of the analysis.

Based on the massive volume of information and data needed to study and analyze, as well as for a more convenient and clearer

analysis of them, a number of 208 strategic economic goods have been studied, which were divided into five large complexes: The Agro-Industrial Complex, the Complex of the Machine Building Industry, the Light Industry Complex, the Heavy Industry Complex and Complex of Construction Materials Industry, these being assigned to the members of the project team. The author was directly involved in the analysis of the Heavy Industry Complex, but the analysis of the shadow economy will cover the entire industry in this section.

Agro-Industrial Complex

Within the Agro-Industrial Complex, based on the data analyzed for the year 2018 with the help of input-output model, deviations have been detected in the import and export of the following types of products: groats, cheese and cottage cheese, cognac, tobacco products, ethyl alcohol, combined feed and perfumery and cosmetic articles. Thus, using the official import and export tariffs and prices for the analyzed production, the volume of losses in the state budget from the account of the Agro-Industrial Complex was estimated at 2639.58 mil. MDL, which constituted 1.37% of GDP (see Table 5, in the Appendix).

Besides the elements of the shadow economy observed in the respective complex, other negative phenomena in the national economy were detected, namely:

- It was found that meat production is about 1.8 times smaller compared to the volume expected according to the average norms of the food basket of the minimum of existence, which reflects the low purchasing capacity.
- The volume of production of groats and dairy products, also, for the year 2018 is much lower (about 5 times) than the requirements of the food basket of the minimum of existence.

Complex of the Machine Building Industry

Following the development of input-output model for 2018, deviations of the following economic goods have been detected within the respective complex: jewelry, video recorders or reproducers, electrical household appliances, transformers <= 16 KVA, parts and accessories for cars- metal cutting tools.

Thus, following the analysis of the unofficial import that took place within the Complex of the Machine Building Industry and using the customs tariffs and the official prices for the given goods, it was

found that the volume of losses to the state budget according to our calculations reached 1325.18 mil. MDL (Table 6), which constituted 0.69% of GDP.

Heavy Industry Complex

The input-output model for the group of economic goods that are present in the Heavy Industry Complex (2018) showed gaps in the following goods: manufacture of pharmaceutical products, manufacture of furniture in assortment, gasoline, diesel.

Thus, following the analysis of the respective complex, it was observed the excessive unofficial import of some products. Using the official import and export tariffs and prices for the given goods, according to the calculations, we consider that there were missed receipts in the state budget in the amount that reached 1243.61 mil. Lei (see Table 7), which constitutes 0.65% of GDP.

Complex of Construction Materials Industry

The input-output model developed for the economic goods of the Complex of Construction Materials Industry for 2018 detected the elements of the shadow economy in the case of nine economic goods. Following the analysis of the difference between the resources and the uses in the case of two economic goods (raw slate; marble and raw travertine, cut into blocks) the export of goods that are not produced in the Republic of Moldova and which were not imported takes place. Thus, one reaches the following conclusion: either the illegal import of these economic goods took place, or the raw material was imported under other customs codes, and then the illegal production followed by the export of these economic goods took place.

According to the data of the statistical report on the circulation of industrial production in the Republic of Moldova, in 2018 there were exported “gravel and pebbles” in the amount of 60.4509 thousand tons, “granules, chips and stone dust” in volume of 17.1193 thousand tons, and “other stones for carving” -0.1422 thousand tons, while according to the export customs declarations of the economic agents in the year 2018 there was not exported “gravel and pebbles”, “granules, chips and stone dust”, and the export volume of “other stones for carving” constituted only 0.04707 thousand tons.

The analysis of the deviations between resources and uses showed that identical situations were detected in the case of other goods of the construction materials industry: Ecausin and limestone; Cement blocks and bricks for construction; Paves, sidewalks and

paving tiles made of natural stone; Tiles, cubes and the like, of natural stone.

Based on the made estimates, we can conclude that the shadow economy of the complex of the construction materials industry caused losses of the state budget in the amount of about 4 mil. Lei.

Light Industry Complex

Within the Light Industry Complex in 2018, the input-output model detected the elements of the shadow economy of the following economic goods: whole cattle skins, sheep skins, tanned furs, duvets, pillows, headboards, trainers, suits and ski suits, knitted briefs, shawls, scarves, coats, veils, veils and the like, furniture coverings, including kitchen covers, furniture covers, headrests and covers for car seats, cotton bags and sacks, embroidery with bottom decorated in pieces, ribbons or decorative motifs. Thus, after analyzing the shadow economy of the given complex of the goods listed above, the authors concluded that the damage to the state amounting to 532,527 mil. Lei was caused.

The adaptation by the author of the input-output model for the situation of the Republic of Moldova allows keeping the correct record of the flow of economic goods, and based on them, the correlation between the branches of industry that can serve in the future for other types of analysis. In the case when the balance in the correlations between the branches is distorted, it will serve as a reason for the intervention of the public authorities. The research carried out using this model approach allow the authorities to make a short- and medium-term forecast for some branches of economy.

5. Conclusions

One of the main functions of the input-output model is to estimate the main macroeconomic indicators and to evaluate the shadow economy. It can be used as an indirect method of assessing a country's economic situation, including by identifying the elements of the shadow economy. An advantage of this model is that it allows the identification of concrete branches or economic activities in which there are signs of the presence of a shadow economy. In addition, the advantages of this model are: possibility of adapting it to the economy of the Republic of Moldova, availability of statistical data that allow work within this model, and the lack of specific costly software needed to use it. At the same time, the widespread use of the model globally allows

comparisons to be made regarding the economic situation of different countries.

Of course, this model also has a number of shortcomings, which can be reduced to the possibility of a margin of error due to the fact that the services sector cannot be covered by that model, as well as the need to constantly update statistical, financial, fiscal and technical data (taking into account the technological evolutions within the enterprises), as the accuracy of the given model depends a lot on the number of specialists involved in the work on data analysis, both at the stage of their introduction and database formation, and at the stage of analysis of results.

The input-output methodology allows us to estimate the losses of the state budget based on the assessment of the volume of hidden production, shadow import and export of economic goods within the industry, using official import and export tariffs and prices for a certain period.

According to estimates, losses of the state budget in 2018 amounted to about 5744.851 million lei or 3.02% of GDP. The agro-industrial complex registered the highest detected values of the shadow economy. These are determined by the greater possibility of leaving the control area by the competent authorities, as well as the imposing presence of peasant households, including small ones, which comply partially or not at all with the rules for submitting tax and statistical declarations and reports. The same situation is present in the other complexes but with different values and shares.

We mention, however, that compared to 2017, the estimated value of the shadow economy is lower. At the same time, the method did not involve the calculation of other economic activities, such as the services sector, the banking sphere, etc., as well as the analysis of the salaries of the categories of personnel involved in production activities, where “envelope” remuneration is still present.

Following the made conclusions, the author comes with a series of recommendations for estimating the shadow economy in the Republic of Moldova:

- In order to conduct a reliable research and bring the result as close as possible to the real situation in the economic sector, it is often recommended to use several cumulative methods.
- The academic environment should pay more attention to researching this phenomenon, by creating strategic

partnerships with such public institutions as the Customs Service of the Republic of Moldova, the State Fiscal Service, the National Bureau of Statistics, the Ministry of Economy and Infrastructure, etc. for more in-depth and comprehensive research on the methodology for assessing the shadow economy.

- Following the analysis through the input - output model, there can be observed the moment when consumption prevails over resources, thus detecting the phenomenon of the shadow economy. At the same time, the source of the excessive consumption, necessary to identify the starting point for the emergence of the shadow economy, cannot be traced exactly up to the economic agent who produced or imported the given good. The introduction of a digitization system of data on the appearance and movement of economic goods as their physical volume and not only monetary, the economic agent being responsible for the given goods, will not only detect the appearance of hidden goods, but also will contribute to a stricter record of economic goods, which will significantly facilitate the collection of data for more accurate statistics and create new opportunities for their analysis.

The author also developed a series of proposals to fight with the phenomenon of the shadow economy:

- Stability of the system of taxation and fiscal procedures. Due to the frequent changes in tax legislation, the economic entity, especially small SMEs, being directly managed by the administrator who also combines the function of accountant, finds it difficult to stay connected to all changes in the field (for example, only in the last 2 years the VAT on the HORECA sector has been reduced from 20% to 10%, then raised to 20% and more recently, reduced to 15% or the introduction of new financial reporting tables or only small changes in their original form, but which implies that the tax reports are not presented correctly as changes are not taken into account).
- Amplifying the process of tax education for entrepreneurs. Due to the fact that the economic agent does not know well the normative and legislative framework, he/she can involuntarily resort to informal economy (informal - all units that deal with the production of goods and services that are legal but not

registered. Usually, they are small size economic agents whose target customer is individuals, are set up from their own resources, have a low level of organization and the division of production factors is not clear). Thus, it would be good for the state to intervene in a provision that requires the administration of the enterpriser to follow certain theoretical courses for a deeper education and a better knowledge of his/her obligations to record and analyze its own business and obtain a certificate of the gained knowledge. On the other hand, if, after obtaining this certificate, the entrepreneur has been found to be practicing the shadow economy, depending on its severity, the appropriate control bodies must take measures to optimize the record of the economic agent, to take measures of administrative punishment, to resort to legal constraints (such as the prohibition of the agricultural economic agent to obtain subsidies from the state), to make public the administration or employers who practice this type of activity in the media, etc.

- Transparency from the state's side regarding the accumulation and distribution of collected taxes and, where possible, the involvement of the economic agent in deciding how to manage these resources. This will encourage the economic agent to come out of the shadows.

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Online resources

www.statistica.md

http://www.wiod.org/home

APPENDIX

Table 3

The natural input-output model for the Republic of Moldova

Product name	UM	A. RESOURCES				B. USES								
		Balance (beginning of the year)	Production	Import	Total resources	Consumption within the country			Production consumption	Totally consumed in the country	Export	Other outputs (loses)	Balance (end of year)	Total use
						By population								
						Total	Including in							
							Organized trade	Unorganized trade						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Product 1	1000 t													
Product 2	1000 t													
Product n	pieces													

Source: processing after Leontief (1925)

Table 4

The natural-value input-output model for the Republic of Moldova

		UM	INTERMEDIATE CONSUMPTION					FINAL PRODUCT								CALCULATION UP TO THE PRICE OF USE					
			Industry	Agriculture	Constructions	Other branches of production	Total intermediate consumption	Retail movement of goods	Goods on the unorganized market	Loses	Import	Export	Stock variation	Total	Total production	Total	VAT	Wholesale discount	Transport expenses	Commercial discount	Excises
A	B	C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Product 1	1.000 lei																			
		mil.kw/t																			
2	Product 2	1.000 lei																			
		mil.Gkal																			
3	Product n	1.000 lei																			
		1000 t																			

Source: processing after Leontief (1925)

Table 5

Losses of the state budget within the Agro-Industrial Complex, 2018

	Deviations	Price	Normative, 2018				Excise	Custom duty	VAT	Excise + Custom duty + VAT	Custom services	State loses
			VAT %	Excise		Custom duty %						
1. Groats, thousands t	11,35	8	20			0,15		13,62	20,89	34,52	0,03	34,55
2. Cheese and cottage cheese, thousands t	1,74	65	20			0,1		11,34	24,94	36,28	0,04	36,31
3. Cognac, thousands dal	360,14	670	20	94,63	lei/l alc.abs	0,5 euro/l alc. abs.	141,12	14,8	79,44	235,36	0,24	235,59
4. Tobacco products bil. pieces	4,61	245	20	0,41		3 euro/1000 pieces	462,97	274,39	373,3	1110,67	1,11	1111,8
5. Ethyl alcohol, mil. dal	1,58	111,3	20	94,63	lei/l alc.abs	0,5 euro/l	619,5	156,87	190,5	966,84	0,97	967,81
6. Combined feed, thousands t	70,38	3	20			0,05		10,56	44,34	54,9	0,05	54,95
7. Etheric oil, t	16	1100	20			0,05		0,88	3,7	4,58	0	4,58
8. Perfumery and cosmetic articles, mil. lei	303,78		20	0,3		0,07	91,13	19,75	82,93	193,81	0,19	194,01
Total												**2639,6**

Source: based on NIER Annual Report, 2020

Table 6

Loses of the state budget within the Complex of Machine Building Industry, 2018

	Deviations	Price	Normative, 2018			Excise	Custom duty	VAT	Excise + Custom duty + VAT	Custom services	State loses
			VAT %	Excise	Custom duty %						
1. Electrical household appliances, thousands pieces	1057,5	3024,5	20		8		255,87	690,86	946,73	0,947	947,68
2. Video recorders or reproducers., thousands pieces	210,9	3754	20		10		79,2	174,2	253,4	0,3	253,6
3. Jewelry , thousands lei	149,04		20	39,27	10	26,1	14,9	38	79	0,1	79,1
4. Transformers <=16KVA, thousands pieces	11799,2	14,6	20	lei/gr	5		8,6	36,1	44,7	0,04	44,8
5. Parts and accessories for cars- metal cutting tools., millions lei	3,98		20		5		0,0002	0,00004	0,00024	0	0,0002
Total						**26,1**	**358,6**	**939,2**	**1323,8**	**1,3**	**1325,1**

Source: based on NIER Annual Report, 2020

Table 7

State loses in the Heavy Industry Complex 2018

	Deviations	Price	Normative, 2018			Excise	Custom duty	VAT	Excise + Custom duty + VAT	Custom services	State loses
			VAT (%)	Excise	Custom duty (%)						
1. Medicines, mil. Lei	463,8		8,0					37,1	37,1	0,5	37,6
2. Furniture, mil. Lei	230,1		20,0		0,1		23,01	46,0	69,0	0,2	69,3
3. Diesel, 1000 T	82,2	10,2	20,0	2092		172		201,4	373,4	0,8	374,2
4. Gasoline, 1000 T	87,3	13,9	20,0	4961		433		328,5	761,3	1,2	762,5
Total						**605**	**23,01**	**613,05**	**1240,87**	**2,74**	**1243,61**

Source: based on NIER Annual Report, 2020

Financial Studies

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