CHAPTER 7

Investigation of the Relationship of Unemployment Rates, Net Foreign Direct Capital Investments and Gross Domestic Increasing Rate With Ardl and Toda Yamamoto Tests: Turkey (1991-2020)

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Introduction

The concept of unemployment has been one of the leading macroeconomics topics that national economies have been

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trying to analyze since the Industrial Revolution. This is because unemployment is not only an individual problem, but also a comprehensive social problem with a negative multiplier effect. When the literature on unemployment is reviewed, there are many studies on the causes and consequences of unemployment and policy recommendations for the solution of unemployment. However, although the number of studies on it is high, only fiew talk about the existence of a policy proposal that has yet completely solved the unemployment problem. In this study, considering the 1991-2020 data, Turkey's net foreign direct investment data and the relationship between the rate of increase in gross domestic product and the unemployment rate were examined through the ARDL limit test and Toda Yamamoto tests with the Eviews 9 package program. The goal of the study is to analyze whether there is a relationship between the variables in the short or long term, the causality between the variables and the time required for a possible shock effect in unemployment rates to pass through the system. In the first part of the study, the conceptual framework was included, in the second part, the samples, methods and results of similar studies in the literature were mentioned, the analysis findings of the study were shared in the third part, and comments and suggestions regarding the analysis results were shared in the last part.

1. Conceptual Framework

Investments from foreign capital investments, which are examined under two headings as indirect and direct, include portfolio investments coming from investors outside that country, while direct investments are from investors outside the country, It refers to investments made in the form of "establishing production facilities, opening branches, acquiring real estate or buying part or all of the shares of an existing company" (Akkaya, 2019: 285).

It is known that FDI, as an important source of capital, is complementary to local investments and has a supportive effect

on the economic growth of the host country (Chowdhury ve Mavrotas, 2005: 1). Although FDI is a product of the global economy and acts as a catalyst for economic development, the output benefit of this task cannot be observed equally in all areas of the economy (Palat, 2011: 261). Therefore, while some macro variables are positively affected by FDI, other have shown negative affect in the analysis of FDI. Net Foreign Direct Investment, on the other hand, expresses the difference between the investment in the host country and the outgoing investment, while this difference gives a negative result if the incoming investment is more than the outgoing investment. While GDP means the total economic value of all final goods and services produced by a country's resident institutional units, the GDP growth rate represents the percentage change of this total value compared to the previous year (OECD, 2022).

Another important concept that forms the basis of this study is the unemployment rate. First, the concept of unemployed is used in the sense of "an individual who cannot work although he wants to work or cannot contribute to the economy although he works", and the situation of people who are suitable for this definition is expressed as unemployment (Metin, 2022: 25). Unemployment rate, on the other hand, is defined as "the ratio of the unemployed population in the labor force" (TÜİK, 2022).

In this study, statistical data on the concepts described above were obtained through the World Bank (https://data.worldbank.org/).

2. Similar Studies in the Literature

When the literature on the subject is reviewed, we found many theoretical and empirical studies prepared both for Turkey and for different countries. Prominent observed studies on the subject have been tried to be included through the following tables.

In Table 1.1, there are national and international studies that found a significant relationship or causal link between unemployment rates, FDI and GDP.

Table 1.1. Some Studies Finding a Relationship Between Unemployment, FDI and GDP in the Literature Review

Author and Publication Date	Sample, Years Covered and Method	result
Chowdhury ve Mavrotas (2005)	Chile, Thailand 1969- 2000 Toda-Yamamoto	It has been determined that there is a "bidirectional causality relationship between the variables" in Malaysia and Thailand.
Jayaraman, T. K., Singh, S., (2007)	Fiji 1970-2003 ARDL Granger	They concluded that Foreign Direct Investment (FDI) positively affects employment.
Chang, S. C. (2007)	Taiwan 1981-2003 VAR	It has been revealed that employment is affected by FDI.
Ajaga, E., Nunnenkamp, P., (2008)	America, 1977-2001 Johansen Cointegration Toda-Yamamoto Granger	Besides cointegration, two-way causality was found between FDI and outcome variables.
Palát, M. (2011)	Japan 1983-2009 correlation	It has been determined that there is a significant relationship between FDI and unemployment.
Shaari, M. vd. (2012)	Malaysia 1980-2010 Least Squares	They found that FDI reduces the unemployment rate and increases GDP.

Stamatiou,P., Driksakis, N. (2014)	Greece 1970-2012 ARDL - VECM Granger	It has been determined that there is a strong unidirectional causality between the unemployment rate, FDI, and economic growth in the long run, between economic development and FDI in both the short and long run, from economic development to FDI.
Şahin, L. (2016)	Some SADC Countries (Madagascar, Lesotho, Mozambique, South Africa, Namibia, Tanzania, Zimbabwe and Zambia) 1992-2013 Panel dynamic least squares method	"It was concluded that there is a positive relationship between FDI and employment".
Erçakar, M.E., Güvenoğlu, H. (2018)	Turkey 1980- 2016 Johansen cointegration test Granger causality test	There is a negative and statistically significant relationship between FDI and unemployment, but no relationship could be found between FDI and unemployment in the short run.
Bayır, M., Şahin Kutlu, Ş. (2019)	Turkey 1988-2017 ARDL Limit Test	It has been determined that GDP, "vocational education and university education have a negative effect on youth unemployment in the long term, and a statistically significant and positive effect on GDP unemployment in the short term".

Korkmaz, Ö., Daştan, B. (2020)	Turkey 2005- 2019 Maki cointegration test Toda-Yamamoto causality test	It has been determined that "there is no long-term relationship between FDI and unemployment", but "there is a unidirectional causal link from unemployment rate to foreign direct investment".

Some of the national and international empirical studies that stand out in the literature and have determined that there is no relationship or causal link between unemployment, FDI and GDP are listed in Table 1.2.

Table 1.2. Some Studies Not Finding a Relationship Between Unemployment, FDI and GDP in the Literature Review

Author and Publication Date	Sample, Years Covered and Method	result
Bilgin, M. H. (2004)	Turkey 1980- 2002 Regression Analysis	No significant relationship was found between FDI and employment level.
Peker, O., Göçer, İ. (2010)	Turkey 2000-2009 ARDL	There is no statistically significant relationship between FDI and unemployment in the long run, and it has been determined that FDI increases unemployment in the current period, but decreases after two periods in the short run.
Üçler, G. Vd (2013)	Turkey 1989-2011 ARDL	It has been determined that FDI has no significant effect on employment.
Noyan Yalman, İ., Koşaroğlu, Ş.M., (2017)	Turkey 1988-2016 Granger Toda-Yamamoto	There is no causal relationship between FDI and national income and unemployment.

Balkanlı, O.A. (2019)	Turkey 1985-2017 Cointegration and stationarity analysis	It has been determined that there is a positive relationship between FDI and economic growth in the long run.
Ağır, H., Rutbil, M. (2019)	Turkey 1974-2017 VAR analysis based impulse response functions, variance decomposition and causality estimations	It has been determined that FDI coming to Turkey, "fixed capital investments and per capita gross domestic product variables are not cointegrated" and that FDI has a limited effect on explaining economic growth.
Akkaya, M. (2019)	China, Brazil, India, Russia, Turkey, 1995-2016 Dynamic panel data method	Although there is a relationship between FDI and economic growth, there is no relationship between FDI and interest, openness, domestic consumption and unemployment.
Canbay, Ş., Kırca, M. (2020)	Turkey 1991-2016 ARDL Limit Test Granger Causality Test	Although the variables are cointegrated, there is no statistically significant relationship with FDI in the short run, a 1% increase in FDI in the long run increases unemployment by approximately 0.96%, "according to the results of the causality analysis based on the error correction model in the long run". It has been determined that there is a causal relationship from unemployment to unemployment.

Bayrakdar, S., Soyyiğit, S., (2020)	China, India, Brazil, Russia, Indonesia, Mexico, Turkey, 1993-2017 Structural break cointegration analysis	"There is a long-run relationship between the share of FDI in GDP and employment; It was seen that it had a negative effect for Brazil and India, but did not have a statistically significant effect for Turkey and Mexico.

When the studies in the tables are examined, it is hard to conclude that there is a causal relationship between FDI and GDP and unemployment rates. Because the relationship and causality bond differ according to the period in which the empirical analysis is made and the data of the country that is the basis of the analysis. However, it has been determined that almost none of the studies have been analyzed with the net of foreign direct investment and the effect of this factor on unemployment rates has not been examined.

Based on the differences in results, in this study, the relationship between Turkey's net foreign direct investment data and the rate of increase in gross domestic product with unemployment rates was examined in order to draw attention to a possible lack of literature.

3. Analyzes and Results

In the study, annual NFDI, GDP growth rate and unemployment rate data of Turkey covering the years 1991-2020, compiled using World Bank data.

The data based on the analysis are given in Table 2.1. Since Turkey's DNYSY data reported negative results every year (since the incoming capital is more than the outgoing capital), this variable has been used in the analysis by making it positive, as follows.

Table 2.1. GDP, Unemployment Rates, Net Foreign Direct Investment (NFDI): Turkey 1991 – 2020 (Source: The World Bank, 2021).

Years	GDP (Annual, % Increase)	Unemployment Rates (Annual, %, ILO Model)	DNYSY ($)
1991	0,72	8,21	783.000.000
1992	5,04	8,51	779.000.000
1993	7,65	8,96	622.000.000
1994	4,67	8,58	559.000.000
1995	7,88	7,64	772.000.000
1996	7,38	6,63	612.000.000
1997	7,58	6,84	554.000.000
1998	2,40	6,89	573.000.000
1999	3,26	7,69	138.000.000
2000	6,93	6,50	112.000.000
2001	5,75	8,38	2.855.000.000
2002	6,45	10,36	939.000.000
2003	5,76	10,54	1.222.000.000
2004	9,80	10,84	2.005.000.000
2005	8,99	10,64	8.967.000.000
2006	6,95	8,72	19.261.000.000
2007	5,04	8,87	19.941.000.000
2008	0,82	9,71	17.302.000.000
2009	4,82	12,55	7.032.000.000
2010	8,43	10,66	7.617.000.000
2011	11,20	8,80	13.812.000.000
2012	4,79	8,15	9.638.000.000
2013	8,49	8,73	9.927.000.000
2014	4,94	9,88	6.287.000.000
2015	6,08	10,24	14.167.000.000
2016	3,32	10,84	10.697.000.000
2017	7,50	10,82	8.339.000.000
2018	2,98	10,89	9.235.000.000
2019	0,89	13,67	6.323.000.000
2020	1,79	13,92	4.699.000.000

For the analysis, ARDL limit test and Toda Yamamoto tests were applied through the Eviews 9 package program and the necessary pre-tests to perform these tests were applied. From the abbreviations used while transferring data to the Eviews program, "UNEMP" refers to unemployment rates, "GDP" refers to GDP growth rate, "FDIN" refers to net foreign direct investment, and "LNFDIN" refers to net foreign direct investment with logarithms.

3.1. Unit Root Test Results

The first pre-test was the Agumented Dickey-Fuiler (ADF) Unit Root test, which is an extended version of the Dickey-Fuller (DF) test to prevent the spurious regression problem (Granger and Newbold, 1974) and to increase the reliability of the analysis. termed and trended". It is used to mean stationary at the I(0) level and stationary at the I(1) difference, and the ADF test results of the variables based on the study are given in Table 3.1.

Among the variables, unemployment rate was found to be stationary in difference I(1), GDP growth rate was found to be stationary at level I(0) and LDNYSY was found to be stationary in difference I(1).

Table 3.1. ADF Unit Root Analysis

Variables	ADF	t-Statistic	prob	Test Critical Values		
				%1	%5	%10
UNEMP	Level Intercept	-0.979493	0.7470	-3.679322	-2.967767	-2.622989
	Level Trend&Intercept	-3.100565	0.1255	-4.323979	-3.580623	-3.225334
	1st Difference Intercept	-4.542682	0.0012	-3.689194	-2.971853	-2.625121
	1st Difference Trend&Intercept	-4.594553	0.0054	-4.323979	-3.580623	-3.225334
GDP	Level Intercept	-4.083127	0.0037	-3.679322	-2.967767	-2.622989
	Level Trend&Intercept	-4.190896	0.0131	-4.309824	-3.574244	-3.221728
	1st Difference Intercept	-4.641283	0.0011	-3.711457	-2.981038	-2.629906
	1st Difference Trend&Intercept	-4.782129	0.0038	-4.356068	-3.595026	-3.233456
LNFDIN	Level Intercept	-1.578735	0.4803	-3.679322	-2.967767	-2.622989
	Level Trend&Intercept	-2.178583	0.4831	-4.309824	-3.574244	-3.221728
	1st Difference Intercept	-5.964540	0.0000	-3.689194	-2.971853	-2.625121
	1st Difference Trend&Intercept	-5.872675	0.0003	-4.323979	-3.580623	-3.225334

3.2. ARDL Limit Test Results

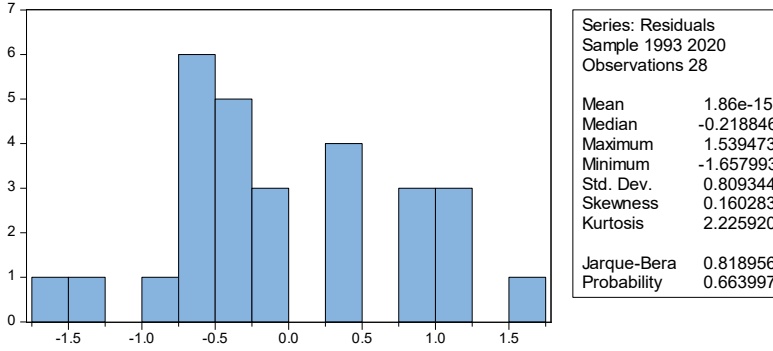
"Autoregressive Distributed Lag" (ARDL), a method that was translated into Turkish as Distributed Delay Autoregressive Model and developed towards the end of the 1990s (Pesaran and Shin, 1997), ARDL bounds test allows "to search for possible long-term relationships between integrated series from different levels" (Destek, 2019: 1481). In order to use this method, there are five pre-tests that need to be examined, the first of which is the "Breusch-Godfrey Serial Correlation LM Test", which is an autocorrelation test. In this test, the f statistic probe value was 0.80. Since the probe value was greater than 0.10, it was determined that there was no autocorrelation problem in the analysis. Then, the varying

variance test was performed, and as a result of the ARCH test, the f statistic probe value was 0.71, and it was determined that there was no varying variance problem. In order to determine whether the correct functional form is used, the RAMSEY Reset test was used, and since the probe value of the f statistic was 0.4924, it was concluded that the correct functional form was used. The mentioned results are given in Table 3.2.

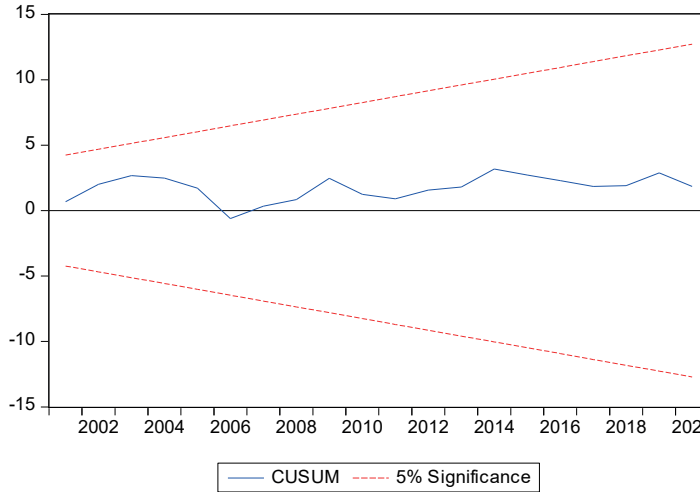
Table 3.2. LM, ARCH and Ramsey RESET Results

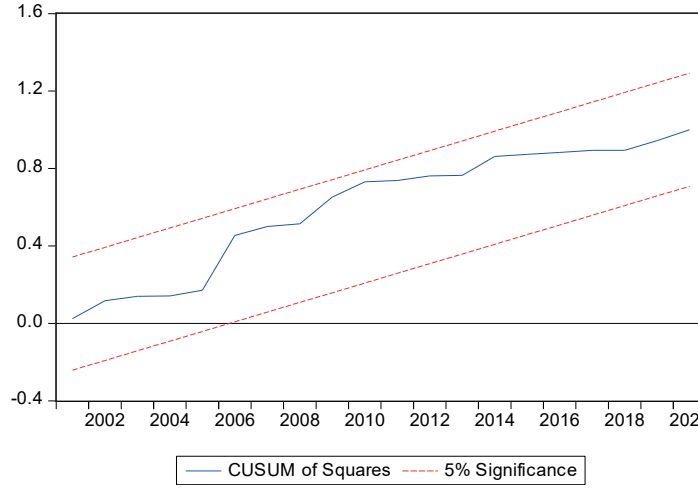
	F-statistic	**Prob.**
LM Test	0.059508	0.8099
ARCH	0.137926	0.7135
Ramsey RESET	0.490126	0.4924

In the Jarque-Bera test performed for the normal distribution, the probe value was 0.663997, and it was concluded that the series showed a normal distribution.



If the parameter stability condition is Cusum and Cusum of Squares test results are given in the graphs below, it is understood that the parameter stability conditions are met.





Limit values are very important for making short and long term interpretations between variables. If the F statistic is below I0 bound, it is interpreted that there is no cointegration relationship, if it is in the I0-I1 Bound range, cointegration can only be interpreted at a different stage, and if it is above I1 Bound,

there is cointegration between the variables (Bingöl ve Pehlivan, 2018: 176). The calculated f statistic is 5.93, and considering the 10% critical value based on the study, it is possible to talk about the existence of a cointegration relationship between the variables, since I1 is above the bound of 4.02.

Table 3.3. Bound Test Results

Test Statistic	**Value**	**K**
F-statistic	5.930770	2
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	3.38	4.02
5%	3.88	4.61
2.5%	4.37	5.16
1%	4.99	5.85

The results of the short-term coefficients are given in Table 3.4. The effect of an increase in GDP on unemployment rates is significant and negative in the short run. It is seen that direct net foreign capital investments do not have a significant effect on unemployment rates (prob.:0.14) in the short run. However, it is seen that the 1-lagged value of net foreign direct investment investments, in other words, the value of 1 period ago has a positive and significant effect on unemployment (D(LNFIN(-1) prob. 0.024)). The error correction coefficient (CointEg(-1): -0.33) allows to comment on the dependent variable being freed from a shock effect that may occur in the system. Accordingly, it is estimated that it will take approximately 3 years for a shock effect on unemployment to disappear.

Table 3.4. Short run Floor Number Results

Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(GDP)	-0.146420	0.060436	-2.422750	0.0250
D(LNFDIN)	0.343645	0.225190	1.526025	0.1427
D(LNFDIN(-1))	0.526476	0.215585	2.442086	0.0240
C	4.682563	0.876930	5.339721	0.0000
CointEq(-1)	-0.339739	0.065044	-5.223173	0.0000

In the long run, an increase in GDP appears to have a significant and negative effect on unemployment rates. However, it has been determined that net foreign direct investment does not have a significant effect on unemployment rates in the long run.

Table 3.5. Long-Run Coefficient Results

Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
GDP	-1.228935	0.624835	-1.966815	0.0632
LNFDIN	0.051730	0.698250	0.074085	0.9417
@TREND	0.141060	0.126972	1.110950	0.2798

3.3. Toda Yamamoto Test Results

Toda Yamamoto (1995) is one of the important analysis methods that reveals the causal relationship between the unit rooted states of the variables without making them stationary. However, it is also important to test the lag lengths in order to ensure the future reliability of the estimates and the relationship between them (Noyan Yalman ve Koşaroğlu: 2017, 199). In this direction, since

the unemployment rate and net foreign direct investment variables are stationary variables in the first difference, the optimum lag lengths of these variables as [d(unemp) (gdp) d(lnfdin)] were tested. As a result of the "VAR Lag Order Selection Criteria" test, all information criteria of "Akaike, Schwarz, and Hannan-Quinn" determined the lag length of 0 as optimum, but the lag length of 1 was considered as the optimum delay since the use of 0 could not give reliable results.

Table 3.6.Delay Length Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-132.9183	NA*	6.970865*	10.45526*	10.60042*	10.49706*
1	-124.7944	13.74827	7.511234	10.52264	11.10330	10.68985
2	-119.6554	7.510736	10.45248	10.81965	11.83580	11.11226
3	-116.2918	4.139854	17.54349	11.25322	12.70487	11.67124

The table regarding the causality results of Toda Yamamoto performed with the VAR(dmax+k) model with 1 lag length is as follows. On the basis of probe 0.10 significance level, there is a causality between GDP growth rates and unemployment rates. Likewise, a causality has been determined from direct net foreign capital investments to the unemployment rate. However, no causal relationship was found from unemployment rates to GDP and from NFDI to GDP. Likewise, no causality has been determined from unemployment rates to NFDI and from GDP to NFDI.

Table 3.7. Toda Yamamoto Causality result

Dependent variable: UNEMP

Excluded	Chi-sq	df	Prob.
GDP	5.799016	1	0.0160
LNFDIN	4.703722	1	0.0301
All	8.822041	2	0.0121

Dependent variable: GDP

Excluded	Chi-sq	df	Prob.
UNEMP	0.018352	1	0.8922
LNFDIN	0.785170	1	0.3756
All	0.790850	2	0.6734

Dependent variable: LNFDIN

Excluded	Chi-sq	df	Prob.
UNEMP	0.026402	1	0.8709
GDP	2.417045	1	0.1200
All	2.683916	2	0.2613

Conclusion and Discussion

In the study, it has been tried to analyze whether there is a short or long term relationship between the unemployment rates in Turkey between 1991 and 2020, the rate of increase in gross domestic product and net foreign direct investment, and if there

is, the effect of this relationship and the possible causal relationship between the variables. As a result of the tests, it was concluded that an increase in the GDP growth rate both in the short run and in the long run affects the unemployment rate negatively. Since the negative effect of unemployment rate will mean that unemployment will decrease in percentage, it is concluded that the increase in GDP reduces unemployment both in the short and long run.

In the tests conducted with the net of foreign direct investment, it has been determined that there is no significant relationship between the unemployment rate and the long run unemployment rate. However, it has been concluded that contrary to what is expected or desired by the economic actors in the short run, it affects unemployment rates positively, in other words, it increases unemployment. It is possible to say that this result is due to the entry of foreign capital into Turkey by purchasing various national enterprises, rather than by establishing a new business area. In addition, it is possible to interpret that a net increase in foreign capital will increase unemployment in the short term, as a result of a revision in working relations with the detection of hidden unemployed (employees with marginal productivity) in enterprises.

The analyzes have shown that if there is a shock effect caused by GDP increase rates and NFDI in unemployment rates, this shock effect can be eliminated after approximately 3 years from the system. This estimation not only reveals the importance of the stable increase in GDP, but also reveals the stability that will be brought by growth with domestic capital rather than foreign capital.

In the analysis of causality relations, it has been observed that there is a one-way causality between the GDP growth rate and unemployment rates. Similarly, the one-way causality relationship between NFDI and unemployment rates has been revealed by the analyzes made.

As a result, The analyzes show that the way to reduce unemployment rates for Turkey is to increase the GDP ratios with domestic capital rather than foreign direct investments. In future studies, it will contribute to the literature by going down to the sub-dimensions of unemployment and analyzing the effects of NFDI and GDP growth rates on youth unemployment rates and educated unemployment rates.

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