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AN EMPIRICAL INVESTIGATION OF THE RELATIONSHIP BETWEEN THE FOREIGN DIRECT INVESTMENT(FDI) AND GROSS DOMESTIC PRODUCT(GDP) REGARDING TURKEY: OLS APPROACH

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Introduction

As it is known it is quite an actual topic nowadays. Foreign Direct Investment (FDI) is a flow of cash organized by a unit such as a company or an individual, which is aimed at a business located in another country. The essential feature of foreign direct investment is that it is an investment that establishes an effective control of the decision-making of a foreign business or at least substantially influences it.

The reasons why this topic has been chosen for this study:

The role of foreign direct investment has been on the rise since the second half of the 1980s as countries have become increasingly important in economic development policies.

Due to the new technologies, they have brought together, new management understanding, and a number of possibilities, these investments have become demanded not only by the developing countries but also by the developed countries. The positive contributions made by foreign investments have made it possible for many countries, which previously considered a foreign investment to be negative, to open their borders and to pay more attention to attracting more direct foreign investment. Turkey has adopted new policies and strategies in this regard as it has been witnessing the introduction of foreign direct investment into the country as well as the widespread view that the problems of the countries suffering from capital shortages will arise immediately and have a positive effect on other macroeconomic indicators. That is why this topic is chosen by me for this article.

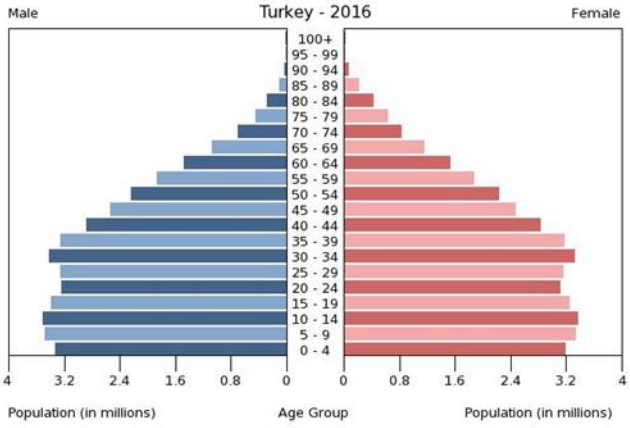
The reason why Turkey is chosen as an example country:

One of the reasons is that my motherland Azerbaijan has a very good relationship with Turkey. In comparison with Azerbaijan, which has plenty of natural resources, Turkey, is not rich enough with its resources, but on the contrary, Turkey's economy is developing faster than Azerbaijan`s. The economy of Turkey shifted from the agrarian sector to the industrial one. It was very interesting to me why it is like this and that is why I started my research. One of the most heavily industrialized countries in the world. Due to Turkey`s candidacy into European Union, dates are available in most of the sources of the statistics. Turkey is a very profitable and suitable place for Foreign Direct Investment (FDI). Below mentioned figures will show us the reasons:

Picture 1: Geolocation of Turkey
Source: https://www.alamy.com

According to the trade theory, the choice of location for international production depends on factor costs [4]. Turkey plays the role of the bridge between Europe and Asia. Due to a very advantageous location (surrounded by three seas), the transportation cost of the product is very low (See Picture 1).

Also, the huge market size of Turkey is an advantage in attracting foreign investors into the economy. According to the market size theory, the amount of investment in the home country depends on the market size or the Gross Domestic Product (GDP) of the country. When the market size of a country reaches scale economies, it becomes a target for foreign direct investment [5]. According to the trade theory, the choice of location for international production depends on factor costs.



Graph 1: Higher Education and Syrian Refugee Students: The Case of Turkey (Yavçan, El-Ghali,2017)

According to graph 1, the majority of the population of Turkey consists of young people. This is one of the biggest reasons why Turkey is very successful in attracting foreign investors into the economy (See Graph 1) [8]. Additionally, with 79 million people (2016) the population of Turkey is large enough in order to attract the attention of foreign investors.

Graph 2: Gross minimum monthly wage
Source: https://tradingeconomics.com/turkey/minimum-wages

This graph shows us the gross minimum monthly wage in Turkey with Turkish Lira (2029.5 TL is approx. 431 EUR) which is very attractive for FDI (See Graph 2). Because in the industry sector wages are based on minimum wage and in comparison to EU countries minimum wage in Turkey is less. It is one of the most important factors which affects the opinion of foreign investors (Moosa, 2002).

Therefore, lots of empirical studies have been done by several researchers from different parts of the World. For instance, Alagöz et al., analyzed the relationship between direct foreign investment and economic growth in Turkey for the period from 1992 to 2007 [1]. The regression analysis has been utilized for the empirical part of the paper. According to the results which were gained from regression analysis there was no causal relationship between FDI and economic growth in Turkey. Ekinci examined the long-term relationship between foreign direct investment, economic growth, and employment in Turkey for the time span from 1980 to 2010 [2]. According to the results, there was no relationship between foreign direct investment and employment, although there was a long-run relationship between direct foreign investment and economic growth. Moreover, the causality relationship between direct foreign investments and economic growth seems to be bidirectional. Yılmaz et al. analyzed the effects of foreign direct investment on economic growth in Turkey for the time period from 1980 to 2008 [9]. According to the results of the analysis, there was a one-way causality relationship running from foreign direct investment to economic growth. Therefore, estimation results have shown that foreign direct investment has positive effects on economic growth.

Methodology

Data

All data for the analytical part used in the thesis, retrieved from the Tradingeconomics online database (www.tradingeconomics.com) [6], whereas the analyzed time series frame is ranged from the periods 1980-2016. However, the data included observations of the GDP and FDI (Foreign Direct Investment) inflow into the Turkish Economy, as follows:

-GDP, Gross Domestic Product of Turkey, prices (in million USD).

-FDI, Foreign Direct Investment inflow on Turkish Economy, prices (in million USD).

Methodology

Analytical methods used for the empirical part include the following:

-Ordinary least squares (OLS) regression analysis model (Jaffe et al., n.d.);

-Autocorrelation is the problem that I faced using a regression analysis model based on time series data. Cohrane – Orcutt is one of the best models to solve the problem with autocorrelation [3].

Software used for the empirical part:

-Gretl software (for time-series plots, Ordinary least squares (OLS) regression analysis model and Cohrane-Orcutt regression);

Results

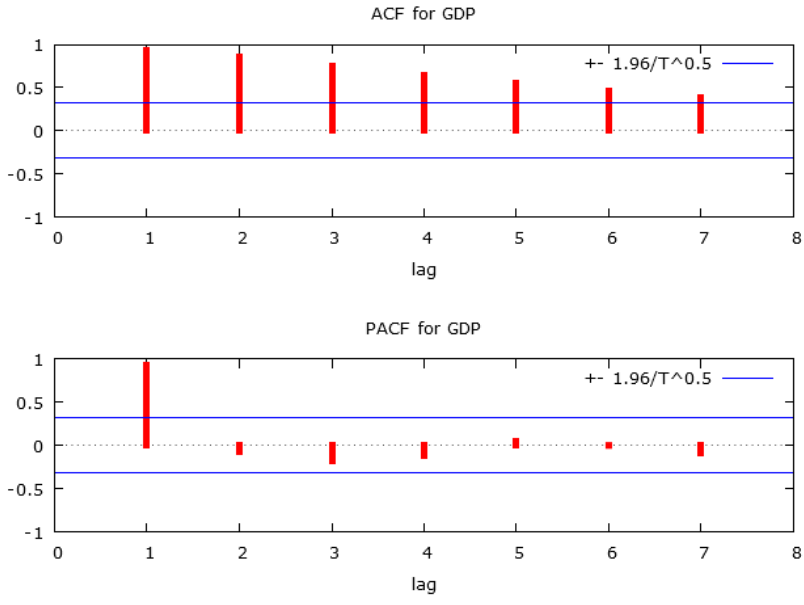
In order to find out the time dependence of economic growth and to eliminate the autocorrelation of the time series, I used ACF and PACF models and a correlogram. After defining the lags of the time series and checking the autocorrelation with Durbin-Wattson criteria test, an OLS model was built. In further steps Cochrane–Orcutt method was applied.

Table 1 shows the autocorrelation function results for GDP, while Graph 3 visualizes the ACF and PACF model results.

Autocorrelation function for GDP

LAG	ACF		PACF		Q-stat.	[p-value]
1	0.9287	***	0.9287	***	34.5736	[0.000]
2	0.8519	***	-0.0774		64.4948	[0.000]
3	0.7553	***	-0.1844		88.7094	[0.000]
4	0.6487	***	-0.1234		107.1121	[0.000]
5	0.5546	***	0.0511		120.9838	[0.000]
6	0.4664	***	-0.0009		131.1072	[0.000]
7	0.3778	**	-0.0880		137.9719	[0.000]

Table 1: ACF and PACF for GDP
Source: Author's own calculations



Graph 3: ACF and PACF for GDP
Source: Author's own calculations

ACF shows lesser lags. The first lag is 0.92, which shows a strong correlation between the first year (1980) and the next year (1981), then this relationship gets weaker, but not significantly, thus, according to ACF for GDP, a relationship is significant since all the lags exceed the blue line. The same results are for FDI, the relationship between years is significant.

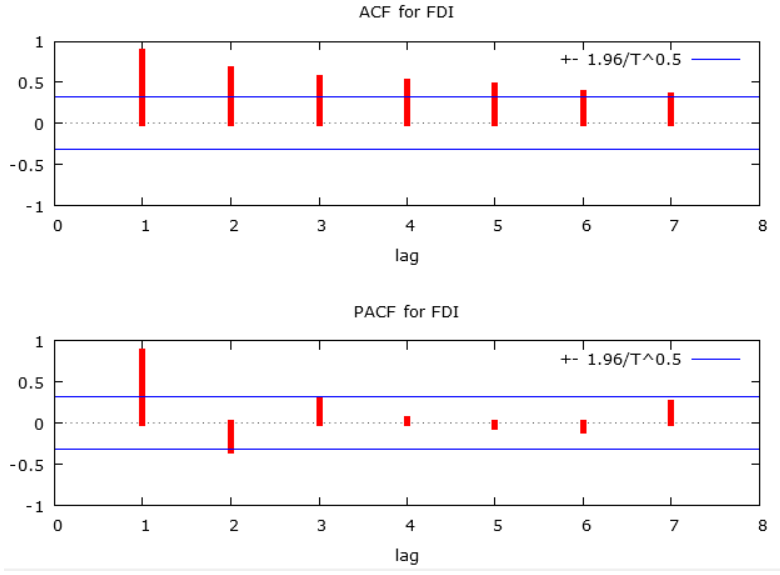
The results of the statistical part of the thesis have gotten by using Gretl software. Autocorrelation – to see how close each year is connected with each other.

Table 2 shows the autocorrelation function results for FDI, while Graph 4 visualizes the ACF and PACF model results.

Autocorrelation function for FDI

LAG	ACF		PACF		Q-stat.	[p-value]
1	0.8647	***	0.8647	***	29.9680	[0.000]
2	0.6646	***	-0.3290	**	48.1786	[0.000]
3	0.5446	***	0.2904	*	60.7655	[0.000]
4	0.4988	***	0.0500		71.6444	[0.000]
5	0.4565	***	-0.0444		81.0412	[0.000]
6	0.3760	**	-0.0869		87.6203	[0.000]
7	0.3359	**	0.2454		93.0484	[0.000]

Table 2: Autocorrelation function for FDI
Source: Author's own calculations



Graph 4: ACF and PACF for FDI
Source: Author's own calculations

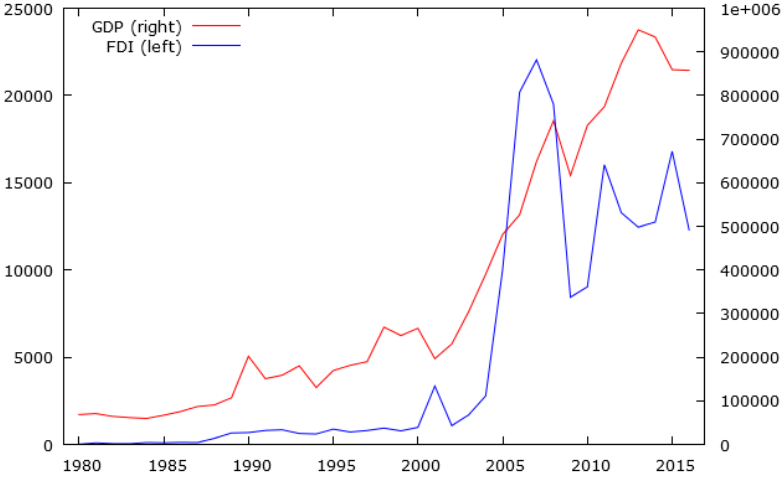


Figure 7: Time-series plot for GDP and FDI on a single plot
Source: Author's own calculations

In nethe xt step an OLS model was applied – it can be used for time-series analysis, if there is no autocorrelation present. First, I built an OLS model (Table 3 shows the results of the Model – ordinary least squares).

```
Model 1: OLS, using observations 1980-2016 (T = 37)
Dependent variable: GDP

             coefficient   std. error    t-ratio    p-value
  ---------------------------------------------------------
  const      156819        31166.3        5.032    1.46e-05  ***
  FDI            37.5780       3.61974   10.38     3.15e-012 ***

Mean dependent var   351993.1   S.D. dependent var   301112.4
Sum squared resid    8.00e+11   S.E. of regression   151201.5
R-squared            0.754856   Adjusted R-squared   0.747852
F(1, 35)             107.7735   P-value(F)           3.15e-12
Log-likelihood      -492.7483   Akaike criterion     989.4966
Schwarz criterion    992.7185   Hannan-Quinn         990.6325
rho                  0.679264   Durbin-Watson        0.657173
```

Table 3: OLS Model using observations of this period 1980 – 2016
Source: Author's own calculations

The estimation formula is (1):

$$GDP = 156819 + 37.57 * FDI \quad (1)$$

It means that with the increase in FDI by one unit, there is an increase in GDP by 37.57 units, which shows a positive relationship between GDP and FDI. Durbin-Watson criteria lie between 0 and 2, where 2 is the ideal value. We have 0.65, so we might suspect autocorrelation. Test for autocorrelation using Durbin-Watson p-value test.

Durbin–Watson statistic = 0.657173
P–value = 3.15e – 12 (less than 0.05)

Null-hypothesis: autocorrelation is not present. We have an extremely low p-value, less than 0.05, thus we reject the null hypothesis other words, autocorrelation is present and the OLS model we built is not correct and we need to switch to a time-series model (based on our previous OLS model). Cochrane-Orcutt is suitable for that purpose.

Relationship model of time-dependent variables

Table 4 shows the results of the model parameters.

```
                ITER        RHO         ESS
                  1       0.67926   2.87193e+011
                  2       0.95437   1.10548e+011
                  3       0.96892   1.07064e+011
                  4       0.97477   1.0594e+011
                  5       0.97827   1.05346e+011
                  6       0.98068   1.0497e+011
                  7       0.98247   1.04708e+011
                  8       0.98388   1.04513e+011
                  9       0.98502   1.04363e+011
                 10       0.98597   1.04363e+011

Model 2: Cochrane-Orcutt, using observations 1981-2016 (T = 36)
Dependent variable: GDP

             coefficient    std. error    t-ratio   p-value
  ---------------------------------------------------------
  const      1.75630e+06   662929          2.649    0.0121  **
  FDI        4.90176            2.81830    1.739    0.0910  *

Statistics based on the rho-differenced data:

Mean dependent var   359859.9   S.D. dependent var   301502.9
Sum squared resid    1.04e+11   S.E. of regression   55370.83
R-squared            0.967915   Adjusted R-squared   0.966972
F(1, 34)             3.025031   P-value(F)           0.091037
rho                 -0.054015   Durbin-Watson        2.102994
```

Table 4: *Analyzing the data using Cochrane–Orcutt model*
Source: Author's own calculations

In this model, the relationship is less significant, but still quite strong. Our final model is (2):

$$GDP = 1.75 + 4.9 * FDI \quad (2)$$

Durbin–Watson statistic = 2.102994
P–value = 0.091037

This model is better than the first model because autocorrelation was corrected. It means, that with the increase in FDI by one unit, there is an increase in GDP by 4.9 units, which shows a positive relationship between GDP and FDI. These results prove that there is a positive relationship between FDI and GDP in Turkey [7].

Disclosure statement

No potential conflict of interest was reported by the author.

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XÜLASƏ

TÜRKİYƏ İLƏ BAĞLI BİRBAŞA XARİCİ İNVESTİSİYA (BXİ) VƏ ÜMUMİ DAXİLİ MƏHSUL (ÜDM) ARASINDAKI ƏLAQƏNİN EMPİRİK TƏDQİQİ: OLS YANAŞMASI

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Bu tədqiqatın məqsədi BXİ-nin rolunu və onun Türkiyənin iqtisadi artımına təsirini ədədi olaraq ölçməkdir. Mən iqtisadi artımın XBİ-dən asılılıq səviyyəsini araşdırmaq və təhlil edilən seriyalar arasında müsbət korrelyasiya olub-olmadığını öyrənmək niyyətindəyəm. XBİ və İqtisadi artım arasında asılılıq OLS reqressiya təhlili modelindən istifadə etməklə yoxlanılacaq. Yuxarıda qeyd olunan mövzuların kəmiyyətcə hesablanması məni verilən nəticələrdən iqtisadiyyata birbaşa investisiya axınının prioritetləşdirilməsinin düzgün BXİ siyasəti ilə bağlı Türkiyənin iqtisadi artımını artıracağı iddiasının doğruluğunu əsaslandırmaq üçün istifadə oluna biləcəyi nöqtsinə gəlməyə kömək edəcək. Bu tədqiqat işinin yekun nəticələri Türkiyənin iqtisadi inkişafının yaxşılaşdırılması üçün mühüm empirik baza kimi təsnif edilə bilər.

Açar sözlər: Türkiyə, BXİ, ÜDM, OLS reqressiya təhlili, Cochrane-Orcutt metodu

РЕЗЮМЕ

ЭМПИРИЧЕСКОЕ ИССЛЕДОВАНИЕ ВЗАИМОСВЯЗИ МЕЖДУ ПРЯМЫМИ ИНОСТРАННЫМИ ИНВЕСТИЦИЯМИ (ПИИ) И ВАЛОВЫМ ВНУТРЕННИМ ПРОДУКТОМ (ВВП) В ОТНОШЕНИИ ТУРЦИИ: OLS

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Целью данной статьи является количественная оценка роли ПИИ и их влияния на экономический рост Турции. Я собираюсь исследовать уровень зависимости экономического роста от ПИИ и выяснить, есть ли положительная корреляция между анализируемыми рядами или нет. Зависимость между ПИИ и экономическим ростом будет проверена с использованием модели регрессионного анализа МНК. Количественная оценка вышеупомянутых тем заставит меня прийти к точке, где данные результаты могут быть использованы для обоснования правдивости утверждения о том, что приоритет притока ПИИ в экономику увеличит экономический рост Турции в отношении надлежащей политики ПИИ. Окончательные результаты этой исследовательской работы можно отнести к важной эмпирической базе для улучшения экономического развития Турции.

Ключевые слова: Турция, ПИИ, ВВП, регх`рессионный анализ МН