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#### Arařtırma Makalesi

## A HISTORICAL ANALYSIS OF THE ECONOMIC DEVELOPMENT OF THE USA (1947-2017)

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#### Abstract

The aim of this study is to evaluate economic improvement of the USA. For this purpose, the quarterly data for the periods between 1947 and 2017 is taken into the consideration. Therefore, focusing on this long period provides a historical view so that more appropriate results can be achieved. Moreover, economic growth of the USA is considered as dependent variable whereas four different subtitles of GDP (consumption, private investment, government expenditure and net export) are selected as independent variables. Furthermore, multivariate adoptive regression spline (MARS) methodology is used in the analysis process. The findings show that private investment, government expenditure and net export have a positive relationship between economic growth. It is identified that the positive effect reduces when the percentage of government expenditure exceeds 22.2%. On the other side, in case of negative net export and having lower investment ratio than 16.3%, economic development of US will be affected negatively. These results give very important information that instead of consumption, other three subtitles of GDP make a contribution to the economic development of US. By considering these results, it is recommended that US should mainly implement growth strategies by focusing on private investment and net export. Within this framework, tax advantages for these investors can be provided to reach this objective. In addition to this condition, government should also give incentives to improve industrial production so that investment and export can be increased.

**Keywords:** US Economy, GDP, Historical Analysis, Economic Development, MARS

#### ABD’NİN EKONOMİK GELİŐMESİNİN TARİHSEL BİR ANALİZİ (1947-2017)

#### Öz

Bu çalıřmanın amacı ABD'nin ekonomik geliřiminin tarihsel bir bakıř açısıyla deęerlendirilmesidir. Bu amaçla, 1947 ve 2017 arasındaki dönemler için üç aylık veriler dikkate alınmıřtır. Bu nedenle, bu uzun döneme odaklanarak daha uygun sonuçların elde edilebilmesi için tarihsel bir analiz yapılması amaçlanmıřtır. Ayrıca ABD'nin ekonomik büyüme oranı bağımlı deęiřken olarak kabul edilirken, GSYİH'nin dört farklı alt bařlığı (tüketim, özel yatırım,

devlet harcamaları ve net ihracat) bağımsız değişkenler olarak seçilmiştir. Öte yandan, analiz sürecinde çok değişkenli uyumlu regresyon uzanımları (MARS) metodolojisi kullanılmıştır. Bulgular, özel yatırım, hükümet harcamaları ve net ihracatın ekonomik büyüme arasında pozitif bir ilişki olduğunu göstermektedir. Belirtilen hususa ek olarak, devlet harcamalarının oranı % 22.2'yi aştığında olumlu etkinin azaldığı tespit edilmiştir. Öte yandan, net ihracatın negatif olması ve % 16.3'den daha düşük bir yatırım oranı olması durumunda, ABD'nin ekonomik gelişimi olumsuz yönde etkilenecektir. Bu sonuçlar, tüketim yerine GSYİH'nin diğer üç alt bileşenlerinin ABD'nin ekonomik gelişimine katkı sağladığına dair çok önemli bilgiler vermektedir. Bu sonuçları göz önünde bulundurarak, ABD'nin özellikle özel yatırımlara ve ihracata odaklanarak büyüme stratejilerini uygulamaya koymasını önerilmektedir. Bu çerçevede, bu hedefe ulaşmak için yatırımcılara vergi avantajlarının sağlanması yerinde olacaktır. Bu duruma ek olarak, hükümet ayrıca, sanayi üretimini iyileştirmek için teşvikler vererek yatırım ve ihracatın artırılmasına olumlu etki edebilecektir.

**Anahtar Kelimeler:** ABD Ekonomisi, GSYİH, Tarihsel Analiz, Ekonomik Kalkınma, MARS

## 1. INTRODUCTION

United States (US) is the most important country in the world due to many different reasons. First of all, it is the country with the best military power. Therefore, with respect to the political aspect, it plays a very significant role in different regions, such as Middle East and Europe. In addition to the political factor, US also affects many different countries regarding the cultural aspects. Because this country attracts the attention of the people for some aspects, citizens of different countries follow US cultural factors in their lives (Baykul, 2018; Yüksel and Zengin, 2016).

Additionally, US has also significant influence on the world as for economic factors (Guttmann, 2016). The main reason behind this situation is that it has the highest gross domestic product (GDP) in the world. Moreover, because of this economic power, US also plays a key role in the international trade (Terzioğlu, 2018; Oladosu et al., 2018). In other words, it has a significant percentage in the export and import amount of the countries. Due to these issues, it is obvious that economic decisions of US affect many different countries in the world. For example, if US decides to increase interest rates, it can cause many different economic problems for emerging economies, such as volatility in exchange rates.

On the other side, US is the country which suffered from a significant economic crisis in 1929 which is also named as great depression (Konuk, 2018; Dinçer et al., 2018a). This crisis crucial economic problems for many different countries in the world. As a result of this situation, investment amount decreased, and unemployment rate went up dramatically. The negative effects of this crisis have lasted about 15 years. After 1945, US economy started to develop with the help of Keynesian economic rules. Similarly, the US economy has the greatest power in the world today. Therefore, it can be said that the motivation behind US economic improvement should be analyzed (Yüksel, 2017a; Dinçer et al., 2017a).

In this study, it is aimed to evaluate economic improvement of US in a historical

aspect. For this purpose, annual data for the years between 1947 and 2017 is taken into the consideration. The main reason of choosing this period is to see the situation after great depression. In addition to this condition, multivariate adaptive regression splines methodology (MARS) is used in the analysis process. Moreover, subtitles of GDP are selected as independent variables. As a result of this analysis, it can be possible to understand which factors mainly contribute the US economic improvement for this period.

This study has many different novelties. Firstly, using a long period data (1947-2017) provides a more historical view and includes many different significant events, such as World War II, globalization and 2008 global economic crisis. In addition to this issue, MARS is a new methodology and provided very successful results in the analyses. Within this framework, MARS methodology is firstly considered in this study with the aim of evaluating economic improvement. Thus, it is thought that this study makes important contribution to the literature.

This study has five different sections. In this first section, general information regarding the selection of this topic is provided. Moreover, in the second stage, similar studies in the literature are review. Additionally, the third section includes quantitative information about US economic growth in historical period. Also, the fourth section considers the application on US economic improvement with MARS methodology. In the final section, the discussion and recommendations are presented.

## **2. LITERATURE REVIEW ON ECONOMIC GROWTH**

Economic growth is a very popular subject in the literature. There are many different studies which focused on this topic on various aspects. Some of the studies aimed to evaluate the relationship between economic growth and income inequality. For instance, Oishi and Kesebir (2015) tried to evaluate this subject for 34 different countries. With the help of survey methodology, they concluded that economic growth of the countries does not contribute to the happiness if income is distributed unequally. Parallel to this study, Vincens and Stafström (2015), Mikucka et al. (2017), Biswas et al. (2017), Wu and Yao (2015), Kennedy et al. (2017) and Rubin and Segal (2015) also concluded that economic growth does not always make people richer. For this purpose, income equality among the people should be provided.

In addition to them, the relationship between balance of payment and economic growth is also evaluated in many different studies. For example, Fasanya and Olayemi (2018) examined this relationship for Nigeria. Within this context, annual data for the periods between 1980 and 2012 is evaluated by using ARDL methodology. As a result, it is defined that current account deficit has a decreasing influence on the economic growth in the future.

Similarly, George (2014), Yüksel (2017b), Saddimbah (2014), Karahan and Çolak (2017), Gokten and Karatepe (2016), Aydın and Esen (2016) and Thomas (2016) are also other studies which reached the same conclusion. They claimed that current account deficit problem should be solved in order to provide sustainable economic growth.

Moreover, the effect of government spending on economic growth was considered by many different researchers. As an example, d'Agostino et al. (2016) tried to analyze the relationship between economic growth and government expenditure by using the data of 106 different countries. With the help of panel regression methodology, it is determined that military expenditure has a negative effect on economic growth. Also, Dunne and Tian (2015), Pan et al. (2015), Töngür and Elveren (2017), Yildirim and Öcal (2016) and Cappella Zielinski et al. (2017) underlined the importance of the same issue in their studies. On the other side, there are also some studies which identified that government expenditure has a positive effect on economic growth (Adegoriola and Siyan, 2015; Aydın et al., 2016; Bunte et al., 2018; Rivero, 2017; Odhiambo, 2015).

Economic growth was also evaluated in different purposes. Herndon et al. (2014), Panizza and Presbitero (2014), Egert (2015) and Kempa and Khan (2016) focused on the negative influences of public debt on economic development. On the other hand, David and Mohammed (2016), Dinçer (2018), Dettrey and Palmer (2015), Pradhan et al. (2015) and Ngare et al. (2014) identified that financial market development is the key factor in economic improvement of the countries. In addition to these studies, Kasman and Duman (2015), Wang et al. (2016), Alam et al. (2016), Dinçer et al. (2019), Salahuddin and Gow (2014), Dinçer et al. (2017b) and Saboori et al. (2014) concluded that energy consumption in the countries contribute to the economic development.

According to the results of the literature review, it is understood that economic improvement was examined by many different researchers in the literature in various aspects. In this context, the relationship between economic growth with income inequality, current account deficit, government spending, public debt, stock market development and energy consumption are the most popular topics. Additionally, many different methodologies, such as regression, ARDL and survey analysis were taken into the consideration in these studies. Nonetheless, there is a need for a new study which evaluates economic development for a long period by using an original methodology.

### **3. QUANTITATIVE INFORMATION ON US ECONOMIC GROWTH (1945-2017)**

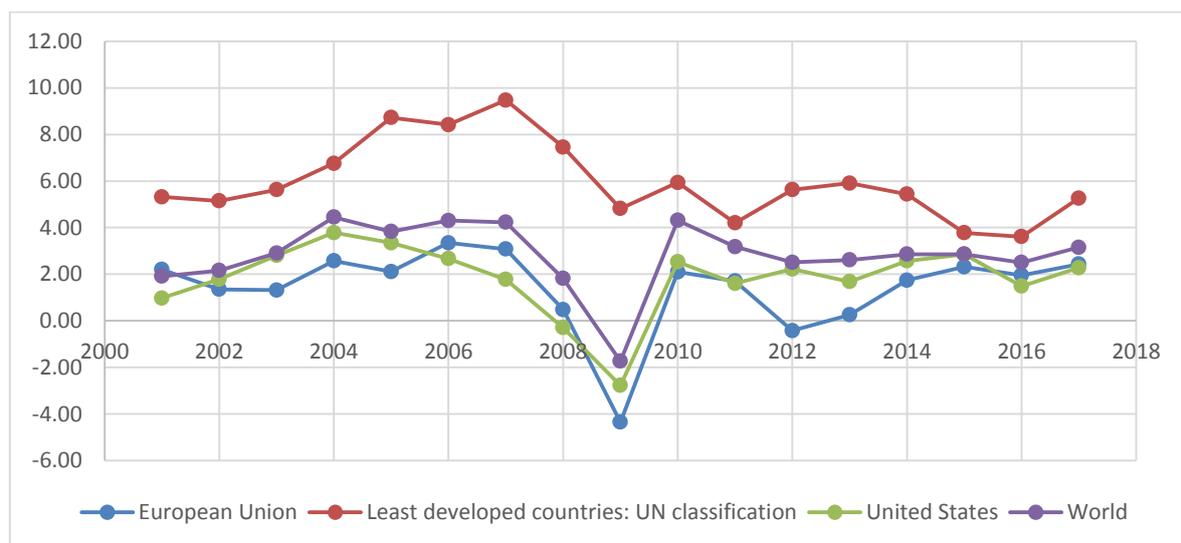
US is the most significant country in the world with respect to the economic factors. Table 1 gives information about the countries which have highest GDP amount in the world in 2017 in term of USD.

**Table 1.** GDP Amount of Selected Countries (trillion USD)

Country Name	2017
United States	19.390
China	12.237
Japan	4.872
Germany	3.677
United Kingdom	2.622
India	2.597
France	2.582
Brazil	2.055
Italy	1.934
Canada	1.653
Russian Federation	1.577
Korea, Rep.	1.530
Australia	1.323
Spain	1.311
Mexico	1.149
Indonesia	1.015
Turkey	851
Netherlands	826
Saudi Arabia	683
Switzerland	678

Source: World Bank

Table 1 shows that US has the highest GDP amount in the world in 2017. Additionally, China is on the second rank. After that, Japan, Germany, United Kingdom and India are also the countries which have high GDP in the world. In summary, it is seen that US GDP amount is quite high in comparison with other countries. On the other side, Figure 1 explains GDP growth rates of some selected countries or regions in the world over the years.

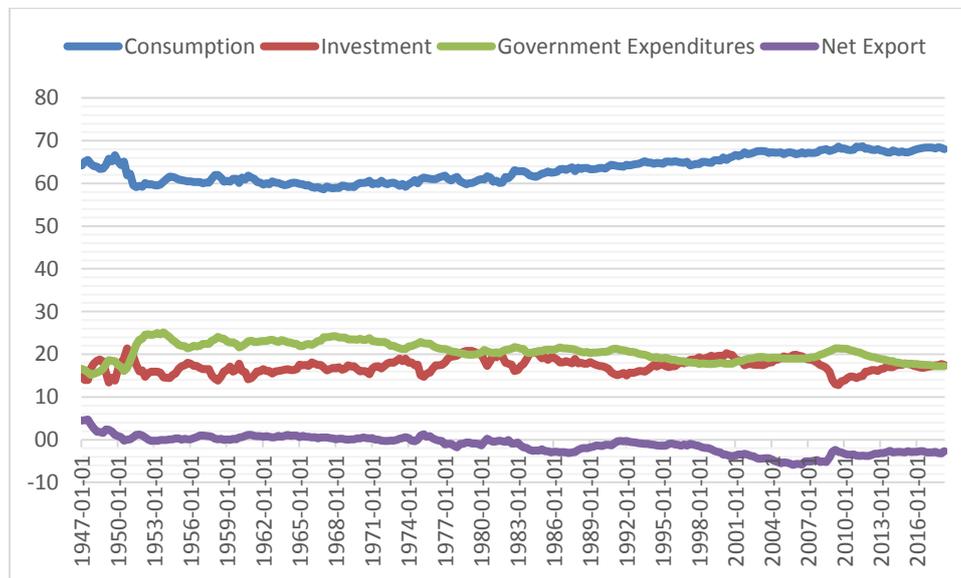
**Figure 1.** GDP Growth Rates of Selected Regions (2000-2017)

Source: World Bank

Figure 1 illustrates that 2008 global mortgage crisis significantly and negatively affected the economic performance of all regions in the world. In this period, GDP of

European Union, least developed countries, United States and the world decreased very much. Additionally, it is also understood that after 2016, US GDP growth rate has an increasing trend. Moreover, Figure 2 explains the percentages of GDP subtitles (consumption, private investment, government expenditures and net exports) of US over the years.

**Figure 2.** GDP Subtitles for US (1947-2017)



Source: Federal Reserve Bank of St. Louis

Figure 2 demonstrates that consumption has the highest percentage in GDP amount for US over the years. It has more than 58% all periods. On the other side, private investment and government expenditures have similar trends while looking at the historical trend. They take values between 12% and 25% for the years between 1947 and 2017. Another important point in Figure 2 is that net export has mainly negative values in these years.

#### 4. A HISTORICAL EVALUATION OF ECONOMIC IMPROVEMENT

In this section, firstly, data set and scope are explained. In addition to them, necessary information about the multivariate adaptive regression spline methodology is shared. In this context, studies in the literature, which used this approach, are defined. After that, analysis results are given.

##### 4.1. Data Set and Scope

In this study, it is aimed to understand the relationship between subtitles of GDP and economic growth. Within this framework, the quarterly data of US GDP growth rate between the years of 1947 and 2017 is used as a dependent variable. Additionally, the percentages of consumption, private investment, government expenditures and net exports to the GDP are

taken into the consideration with respect to the independent variables. This data is provided from the website of Federal Reserve Bank of St. Louis.

#### 4.2. Multivariate Adaptive Regression Spline (MARS) Method

The word MARS can be generated from the expression of “multivariate adaptive regression splines”. As it can be understood from this issue, MARS model is used to understand the relationship between dependent and independent variables. Although this methodology has many different similarities with standard regression method, it has some advantages in comparison with other approaches. The term “multivariate” refers that it is possible to consider many different variables in the analysis process. In addition to this condition, there is not a multicollinearity problem in MARS method. In other words, any significant relationship is not seen between independent variables in this process (Freidman, 1991).

The analysis process of MARS model mainly includes two different stages. Firstly, different functions are generated by considering all possible combinations of the independent variables. In this circumstance, different models are created by using these basis functions. This process goes on until the most complex model is identified. In the second stage, the best model is reached by eliminating some basis functions. In this process, the basis functions, which have a decreasing effect on adjusted  $R^2$ , are deleted from the most complex model. That is to say, the best model has the highest adjusted  $R^2$  value. Equation (1) gives information about this process.

$$Y = B_0 + \sum_{n=1}^K a_n B_n(X_t) + \varepsilon \quad (1)$$

The term “Y” explains dependent variable in the equation 1. On the other side, “X” gives information about the independent variables. Thus, “B” represents the coefficient of these independent variables while “ $\varepsilon$ ” states the error term. MARS model is a very new approach in the literature. Thus, there are few studies by using this approach in social sciences (Tunay 2001; Yüksel, 2016a; Oktar and Yüksel, 2016; Yüksel et al., 2016; Tunay, 2011; Yüksel and Özşarı, 2017; Kartal et al., 2018; Yüksel, 2016b; Oktar and Yüksel, 2015; Yüksel et al., 2018; Dinçer et al., 2018b; Yüksel and Adalı, 2017; Tunay, 2010; Yüksel and Zengin, 2017; Yüksel et al., 2017).

#### 4.3. ANALYSIS RESULTS

In order to measure which dimensions of GDP affect economic growth, GDP growth rate is selected as a dependent variable. Additionally, four different dimensions (consumption, private investment, government expenditure and net export) are considered regarding

independent variables. MARS system created 18 different alternative models for this purpose. The details of these models are given in Table 2.

**Table 2.** Alternative Models

Basis Functions	Total Variables	GCV
18	4	14.76
17	4	14.49
16	4	14.25
15	4	14.14
14	3	13.90
13	3	13.99
12	3	13.82
11*	3	13.62
10	3	13.64
9	3	13.65
8	3	13.66
7	3	13.73
6	3	13.89
5	3	14.21
4	3	14.25
3	3	14.19
2	2	13.90
1	1	14.06

\*ideal model

Table 2 indicates that the ideal model has 11 different basis functions. In this process, firstly, MARS system created all possible alternative models. After that, it eliminates some basis functions which are not successful to explain the dependent variable. In this process, the model with the lowest GCV value is identified as the ideal model because it gives information about the error. The details of these 11 basis functions are given on Table 3.

**Table 3.** 11 Different Basis Functions

Basis Functions	Details	Coefficient	P Values
BF2	$\max(0, 16.300 - \text{INVESTMENT})$	- 4.173	0.000
BF6	$\max(0, 0.800 - \text{NETEXPORT})$	- 5.600	0.000
BF7	$\max(0, \text{GEXPENDITURE} - 17.200) * \text{BF6}$	+ 5.528	0.001
BF9	$\max(0, \text{INVESTMENT} - 15.900) * \text{BF6}$	+ 3.322	0.010
BF10	$\max(0, 15.900 - \text{INVESTMENT}) * \text{BF6}$	+ 2.444	0.015
BF11	$\max(0, \text{GEXPENDITURE} - 21.000)$	+ 4.036	0.000
BF12	$\max(0, 21.000 - \text{GEXPENDITURE})$	+ 2.519	0.012
BF13	$\max(0, \text{GEXPENDITURE} - 24.500) * \text{BF2}$	- 2.936	0.004
BF15	$\max(0, \text{GEXPENDITURE} - 22.200)$	- 4.529	0.000
BF17	$\max(0, 22.200 - \text{GEXPENDITURE})$	+ 2.575	0.011
BF22	$\max(0, \text{NETEXPORT} - 0.300) * \text{BF15}$	+ 5.304	0.000
Prob (F test): 0.000 Adj R <sup>2</sup> : 0.567			

Table 3 shows that all variables are significant because p values are lower than 0.05. Additionally, because probability of F value is lower than 0.05, it is accepted that whole analysis is significant as well. Table 3 states that 3 different variables have an influence on

economic growth. First of all, the variable of private investment is stated in many different basis functions. Table 4 explains these basis functions.

**Table 4.** Basis Functions Related to Investment

Basis Functions	Details	Coefficient	P Values
BF2	$\max(0, 16.300 - \text{INVESTMENT})$	- 4.173	0.000
BF9	$\max(0, \text{INVESTMENT} - 15.900) * \text{BF6}$	+ 3.322	0.010
BF10	$\max(0, 15.900 - \text{INVESTMENT}) * \text{BF6}$	+ 2.444	0.015

Table 4 indicates that investment variable takes place in three different basis functions (BF2, BF9 and BF10). These functions identify that when private investment ratio to the GDP is greater than 15.9 %, it positively affects economic growth in US. On the other side, it has a reducing effect if it is lower than this ratio. Bahal et al. (2018) and Lin and Omoju (2017) reached the similar results in their studies. In addition to the private investment, government expenditure is the second important variable in economic development. Related basis functions are explained in Table 5.

**Table 5.** Basis Functions Related to Government Expenditure

Basis Functions	Details	Coefficient	P Values
BF7	$\max(0, \text{GEXPENDITURE} - 17.200) * \text{BF6}$	+ 5.528	0.001
BF11	$\max(0, \text{GEXPENDITURE} - 21.000)$	+ 4.036	0.000
BF12	$\max(0, 21.000 - \text{GEXPENDITURE})$	+ 2.519	0.012
BF13	$\max(0, \text{GEXPENDITURE} - 24.500) * \text{BF2}$	- 2.936	0.004
BF15	$\max(0, \text{GEXPENDITURE} - 22.200)$	- 4.529	0.000
BF17	$\max(0, 22.200 - \text{GEXPENDITURE})$	+ 2.575	0.011

Table 5 explains that there is a positive correlation between government expenditure and economic growth. However, when the percentage of the government expenditure in GDP amount exceeds 22.2%, BF15 is considered with the negative coefficient (-4.529). In addition to this situation, if this ratio is greater than 24.5%, BF13 has a role in the equation with the negative coefficient (-2.936). This issue emphasizes that when the ratio of the government expenditure is too high, the power of the positive effect decreases. There are also some other studies in the literature that underlined this conclusion (Ihugba and Njoku, 2017; Alexiou and Nellis, 2017). Moreover, net export is the last significant variable that is detailed on Table 6.

**Table 6.** Basis Functions Related to Net Export

Basis Functions	Details	Coefficient	P Values
BF6	$\max(0, 0.800 - \text{NETEXPORT})$	- 5.600	0.000
BF22	$\max(0, \text{NETEXPORT} - 0.300) * \text{BF15}$	+ 5.304	0.000

Table 6 states that net export variable takes place in two different basis functions (BF6 and BF 22). BF 22 gives information that if export ratio in GDP is greater than 0.3, the positive effect of net export on economic growth begins. On the other side, BF6 indicates that if net export ratio is lower than 0.8 %, the negative effect occurs. In other words, if net export

has a negative value (import is greater than export), this situation has a negative influence on economic growth of US. The importance of net export on economic growth was also underlined in some other studies (Mo, 2010; Brueckner et al., 2018).

## 5. DISCUSSIONS AND CONCLUSIONS

United States is a very significant country in the world with respect to the social, political and economic aspects. This country has the highest GDP all over the world. In addition to this situation, US has also a crucial role in international trade. Therefore, it can be understood that US economic performance has an important influence on other countries' economies. Hence, it is quite significant to understand which factors affect the economic growth of US.

In this study, it is aimed to evaluate which subtitles of GDP have an effect on economic growth of US. In this context, economic growth is considered as dependent variable whereas consumption, investment, government expenditure and net export are used for independent variables. For this purpose, quarterly data of these variables for the periods between 1947 and 2017 is taken into the consideration. Therefore, this relationship can be analyzed on a historical view. In addition to this issue, multivariate adoptive regression spline methodology is used in the analysis process.

As a result, it is defined that three different subtitles of GDP have an influence on economic growth of US. Firstly, there is a positive relationship between private investment and economic growth. If the ratio of private investment decreases, economic development of US will be affected negatively. Additionally, government expenditure also affects economic improvement in a positive manner. However, this positive effect reduces when the percentage of government expenditure exceeds 22.2%. Finally, net export has also a positive influence on economic growth. In case of negative net export, economic growth will decrease.

In summary, it is understood that economic growth of US has a relationship between private investment, government expenditure and net export. In other words, it is seen that instead of consumption, other three subtitles of GDP make a contribution to the economic development. Therefore, it can be said that US should implement growth strategies by focusing on private investment and net export. For this purpose, it is recommended that government should give incentives to improve industrial production so that investment and export can be increased. In addition to this issue, it is also thought that US companies should increase production levels. With the help of this condition, it can be possible to increase

domestic production. Thus, there will be no need to import some products. This situation has a decreasing effect on the current account deficit problem of US.

This study focuses on US economy because it plays a very key role in the world. The results provide some opportunities to improve economic development. These strategies can also be implemented by other developed economies. Hence, it is aimed to make contribution to the literature. Nonetheless, a new study that focuses on developing economies in the future can also provide some significant results.

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