

**IB Mathematics: Analysis and Approaches HL Extended Essay**

**MAY 2022**

**Topic: The economical state of Turkey in 2020**

**Research Question: To what extent has Covid affected Turkey economically in 2020,  
how has the Turkish economy changed?**

Word Count: 3952

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# 1.0 Introduction

Covid-19 has been a big part of our lives since December 2019. Especially us, who are students and still haven't proven themselves to society. This is because it interrupted our lives by forcing schools, restaurants, grocery stores, etc. to be shut down. No one would argue that this hasn't had a very big effect on global and national economies.

Covid-19 (coronavirus disease) is caused by the SARS-CoV-2 virus.<sup>1</sup> It is a respiratory disease that affects everyone differently. Some get severely sick while others don't even realize they have the virus. There have been a total of 219 million cases and 4.55 million deaths worldwide. This is a 2% mortality rate. Compared to the normal flu that has a mortality rate of less than 0.1%, considering it has the same pestiferousness as the flu, Covid is a very dangerous disease that has to be taken seriously.

In this research, I decided to calculate how much impact it had on the economy of Turkey. My reasoning for this is that Turkey already has an economy that is collapsing. Therefore, I thought Turkey would be affected severely by the changes it had to adapt to because of Covid.

This topic is especially relevant because it is something that is in our lives at this very moment. It is also very controversial because it is political. I aim to produce a study that is not only unbiased but also accurate. I believe it will be a good historical resource that will be used in the future to remember how a specific country was affected by the Covid crisis.

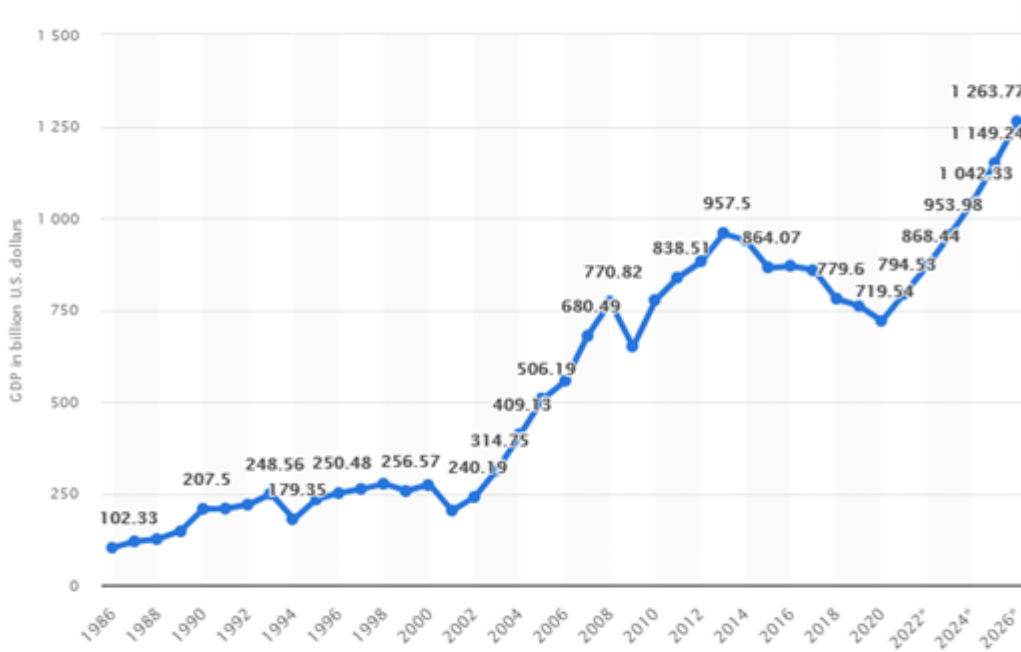
## 2.0 Methodology

I will be mainly focusing on GDP (Gross Domestic Product), the total value of all of the products and services that are offered at a place, and the inflation rate (From now on, it will be referred to as IR) of different products by comparing their prices before Covid and after Covid. I will also look at past years to determine how Turkey has been economically to make reasons for the outcomes. I will use secondary data as it would be very difficult to calculate something like GDP by myself.

There are 9 different products that I used to calculate the average inflation. This is because every product or service will have a different IR since they are not related to Covid only. For example, an increase in computer prices might be because there is a global chip shortage or there is an increased demand for them since everyone is working from home now which would relate back to Covid. However, the abnormal increase in the automotive sector is not because of Covid but is because the Turkish Lira (TL) is decreasing in value drastically as time goes on. Comparing their present prices and past prices, also taking into consideration the normal inflation and GDP increase, I will be able to calculate the effects of Covid in the Turkish economy. This way, my results will be very reliable. I will find these prices from the direct sellers to decrease the chance of there being a mistake in the calculations.

## 3.0 GDP

GDP (Gross Domestic Product): This measure is the sum of the value of goods and services offered during a certain time period. <sup>41</sup>



As you can see, Turkey's GDP has been relatively the same from 1990-2001, With a 25% drop in 2001 due to the economic crisis. However, Turkey quickly recovered from this with some investments proving right and an economical structure being reconstructed. In 2008, the global economic crisis happened but Turkey quickly bounced back from this. In 2014, a depression started. The main reason why Turkey's economy started increasing in 2010 was that European investors were more interested in the high promised returns from Turkey. However, that changed in 2014 when the U.S. made their transactions more secure. This led to more investors going to the US instead of Turkey and started depleting the GDP. Consequently, Turkey's economy started to deplete once again. Going into Covid-19, Turkey was already in a bad economical state. The decrease in GDP was 7.7% in 2020 which was the year of Covid. This is the most decrease in GDP in percent than any other country in Europe.

This could mean that the Covid-19 pandemic was not the only reason for the economical crisis in 2020 in Turkey.

It can be seen from the graph that Turkey had a very close GDP in 2020 as in 2008. When you compare the currency of Turkey, lira, to USD, \$, each year respectively, you see that \$1 was equal to 1.15 TL in 2008, and \$1 was equal to an all-time high of 8.70 TL in 2020. This is just too much for any country to handle. For example, the minimum wage in 2008 was equal to 640 TL = \$525, however, in 2020 this had to be raised to 3000 TL Which only equals \$375. The workers were getting paid more but not really. Everything in the country was off the charts in terms of pricing. Inflation for technological equipment was over %100 and the purchasing power was a lot less.

To calculate the mean inflation for each product, I will first find the percentage inflation for each year, then compare the trend of inflation of each year to the inflation of 2020, I will reach a verdict for each item. Using CPI, I will find the combined average inflation of all of the items per year. When I compare this inflation to the trend in the combined average inflation, I will have an understanding of how Covid affected Turkey's economy.

Of course, Covid may not be the reason for the increase in prices or decrease in GDP or not on pace economical improvements. That is why I will explain the specific scenarios for each item and why we see the price difference.

$$\text{inflation rate} = \frac{\text{new price} - \text{old price}}{\text{old price}} \cdot 100$$

$$\text{average yearly inflation rate} = \frac{\text{total new price} - \text{total old price}}{\text{total old price}} \cdot 100$$

$$\text{Standard Deviation} = \sqrt{\frac{\sum(x-\mu)^2}{N}}$$

N = number of years IR was calculated for

x = IR for the individual year

μ = mean IR of the years

## 4.0 Materials

### 4.1 Bread<sup>2</sup>:

**Table 1:**

Years	Price per kilogram (TL/kg)	IR	IR Calculations	Standard Deviation Calculations
2010	2.00	-	-	-
2011	2.65	32.5%	$\frac{2.65-2.00}{2.00} \cdot 100 = 32.5\%$	$(32.5 - 14.5)^2 = 324$
2012	2.85	7.55%	$\frac{2.85-2.65}{2.65} \cdot 100 = 7.55\%$	$(7.55 - 14.5)^2 = 48.3$
2013	4.00	40.4%	$\frac{4.00-2.85}{2.85} \cdot 100 = 40.4\%$	$(40.4 - 14.5)^2 = 671$
2014	4.55	13.8%	$\frac{4.55-4.00}{4.00} \cdot 100 = 13.8\%$	$(13.8 - 14.5)^2 = 0.49$
2015	5.10	12.1%	$\frac{5.10-4.55}{4.55} \cdot 100 = 12.1\%$	$(12.1 - 14.5)^2 = 5.76$
2016	5.75	12.8%	$\frac{5.75-5.10}{5.10} \cdot 100 = 12.8\%$	$(12.8 - 14.5)^2 = 2.89$
2017	6.35	10.4%	$\frac{6.35-5.75}{5.75} \cdot 100 = 10.4\%$	$(10.4 - 14.5)^2 = 16.8$
2018	7.50	18.1%	$\frac{7.50-6.35}{6.35} \cdot 100 = 18.1\%$	$(18.1 - 14.5)^2 = 13.0$
2019	6.25	-16.7%	$\frac{6.25-7.50}{7.50} \cdot 100 = -16.7\%$	$(-16.7 - 14.5)^2 = 973$
2020	7.15	14.4%	$\frac{7.15-6.25}{6.25} \cdot 100 = 14.4\%$	-

**Mean IR Between 2010-2019 : 14.5%**

$$\text{Standard Deviation: } \sqrt{\frac{324+48.3+671+0.49+5.76+2.89+16.8+13+973}{9}} = 15.1$$

We can see that in 2020, the IR for bread is pretty much the same as the mean IR of the past 9 years. However, we see that there was a decrease in the price of bread in 2019. Therefore, the trend would be expected to continue, and a decrease in the price of bread would have been ideal in 2020. Nonetheless, this was not the case and the price increased by %14.4.

The standard deviation for bread IRs is 15.1. This is very high considering the average is %14.5. This shows the instability of the Turkish Economy even on one of the most essential food sources for the country. The price for next year will be unpredictable just by looking at past prices.

With Covid, farmers were unable to obtain fertilizers from overseas countries since the borders were closed. Therefore, supply had a hard time keeping up with demand which drove wheat prices up, in return affecting bread pricing.

Bread is the main source of food for many people in Turkey since it is their culture to have bread on every meal. That is why it is considered as the main source of food supply, just like water. It has to be kept affordable because everyone needs it. Regardless of this, Covid has managed to affect bread prices negatively.



## **4.2 Rice<sup>3</sup>:**

**Table 2**

Years	Price per kilogram (TL/kg)	IR
2010	4.85	-
2011	4.63	-4.54%
2012	4.24	-8.42%
2013	4.49	5.90%
2014	6.50	44.8%
2015	6.70	3.08%
2016	6.20	-7.46%
2017	6.95	12.1%
2018	7.85	12.9%
2019	9.20	17.2%
2020	10.54	14.6%

**Mean inflation between 2010-2019 = 9.02%**

**Standard deviation of inflation between 2010-2019 = 15.7**

For rice, we can see that initially, there was a decrease in prices which ended in the year 2013 with a typical IR for any country. 2014 was an outlier year when the inflation on rice was absurd, nearly %45. The following years were normal, with an unexpected decrease in 2016 and higher than expected inflation between 2017-2019. These years had numbers that were expected since Turkey started to import more rice than usual since the production of rice wasn't enough. Therefore, the decrease in the value of TL affected rice prices.

2020 had an IR that followed the trend of the past 3 years. Consequently, rice prices were normal for the Covid year. Because of Covid, once again, fertilizers were hard to import. However, since Turkey hasn't been producing much rice since 2016, these restrictions

didn't affect Turkey's rice prices that much. The prices were already going up more than a typical, stable country's prices.

A standard deviation of 15.7 is very close to the bread's standard deviation of 15.1. This proves the instability of the agricultural products' market in Turkey. Nonetheless, IRs for rice of the years after 2017 had a standard deviation of 2.25. Therefore, Covid had no impact on this instability that started years earlier.

#### **4.3 Gasoline**<sup>4</sup>:

**Table 3**

Years	Price per liter (TL/L)	IR
2010	3.87	-
2011	4.29	10.9%
2012	4.57	6.53%
2013	5.00	9.40%
2014	4.60	-8.00%
2015	4.45	-3.26%
2016	5.05	13.5%
2017	5.66	12.1%
2018	6.24	10.2%
2019	6.15	-1.44%
2020	6.98	13.5%

**Mean inflation between 2010-2019 = 5.55%**

**Standard deviation of inflation between 2010-2019 = 7.76**

Gasoline prices have been increasing all over the world, not just Turkey. The main reason for this is that gasoline is a fossil fuel, which means it is limited. Looking at the IRs of the past years, they are fairly normal for any country. Meaning the average inflation is close

to %5. However, we still see an unstable market since the standard deviation is more than the average.

In 2020, we see an IR of %13.5 which is a lot looking at the past year and averages. It is also at the very edge of the standard deviation curve meaning the sum of the average and the standard deviation is less than the IR in 2020. Therefore, in 2020, there was an unordinary increase in the price of gasoline.

This means Covid might have been the reason for this, although Covid might have had an effect on this, it is not just Covid. The economical crisis Turkey is in has had a big impact on gasoline prices. Turkey imports the majority of its oil/gasoline so the decrease in the value of the Turkish lira is also a cause of this increase in price.

#### **4.4 Toyota Corolla <sup>5</sup>:**

**Table 4**

Years	Price (TL)	IR
2010	41,300	-
2011	55,600	34.6%
2012	55,600	0.00%
2013	60,350	8.54%
2014	62,890	4.21%
2015	64,000	1.76%
2016	77,200	20.6%
2017	77,200	0.00%
2018	94,100	21.9%
2019	127,500	35.5%
2020	161,800	26.9%

**Mean inflation between 2010-2019 = %14.1**

**Standard deviation of inflation between 2010-2019 = 14.4**

I chose this particular car because the Corolla model is a staple of the automotive industry. It is one of the most preferred models in the economy class. Therefore, the price of it rarely changes between years ranging between \$20,000-\$23,000 for the starting price (MSRP). Nevertheless, the same can't be said for the pricing in Turkey.

We can see an increase in the price all throughout the 10 years with a mean IR of %14.1 This inflation is absurd considering the retail price of it stays pretty much the same for other countries that have a stable economy. With a standard deviation of 14.4 for the IR, we can come to the conclusion that the automotive sector has been unstable for the past 10 years.

When the average IRs of the past 9 years are compared to the IR in 2020, it is seen that 2020 was an unfortunate year for people who want to buy a car. However, when we look at the trend of the past 3 years, we see that the %26.9 IR is right around the average of those 3 years. This increase in price can't be connected to Covid directly, the global chip shortage has been a major cause of delays and price increases all around the world.

The main reason for the increase in the automotive sector is the decrease in the value of the Turkish lira. These vehicles are imported using foreign currencies, therefore, when TL decreases in value, the prices increase in terms of TL.

#### **4.5 Minimum Wage** <sup>6</sup>:

**Table 5**

Years	Amount (TL)	IR
2010	630	-
2011	701	11.3%
2012	773	10.3%
2013	803	3.88%
2014	1000	24.5%

2015	1300	30.0%
2016	1404	8.00%
2017	1603	14.2%
2018	2021	26.1%
2019	2325	15.0%
2020	2826	21.5%

**Mean inflation between 2010-2019 = 15.9%**

**Standard deviation of inflation between 2010-2019 = 8.94**

An increase in the minimum wage can have a positive effect on the economy of a country, increasing the average buying power of the people. Nonetheless, as explained at the start of my essay, even if the minimum wage increases, if the value of that money decreases, there won't be any improvement to the economy.

With the decrease in the value of the Turkish lira, even with the raises to it, the minimum wage has decreased in quantity when the money is converted to foreign currencies. We see an increase to the minimum wage throughout the past 10 years however, with the decrease in the value of the Turkish lira, these increases are more like decreases, they cannot keep up with the inflation of other products.

The decrease in the value of the Turkish lira cannot be directly caused by the Covid since it has been a problem long before the pandemic started. This can only be tied to poor economic decisions made by the country consisting of being unsupportive of local businesses and productions.

#### **4.6 Water** <sup>7</sup>:

**Table 6**

Years	Price per Volume (TL/m <sup>3</sup> )	IR
2010	2.35	-
2011	2.90	23.4%
2012	3.16	8.97%
2013	3.45	9.18%
2014	3.75	8.70%
2015	3.70	-1.33%
2016	3.90	5.41%
2017	4.20	7.70%
2018	4.37	4.05%
2019	4.53	3.66%
2020	4.00	-11.7%

**Mean inflation between 2010-2019 = 5.8%**

**Standard deviation of inflation between 2010-2019 = 8.87**

Arguably, water is the most essential substance for living things in the world. Therefore, it has to be accessible to even people who are very poor. Keeping water prices low is a responsibility of governments. Therefore, in most parts of the world, even normal 5% inflations don't affect water prices.

Looking at the prices of the past years, it can be said that water was one of the products that had the least increase in price. Nonetheless, the price of it still increased due to the receding economy of Turkey.

In contrast to other products in this list, in 2020, the water prices decreased. This was a direct interference by the Turkish government since water prices were getting out of hand.

Since Turkey does not import water and is a self-sufficient country in terms of water, Covid didn't affect the water prices that much.

#### **4.7 Apple SmartPhone:**

**Table 7**

Year	Model	Retail in the US(\$)	Retail in Turkey (TL)	TL per \$	Inflation
2010	iPhone 4	600 <sup>8</sup>	1570 <sup>9</sup>	2.63	-
2011	iPhone 4s	650 <sup>10</sup>	2020 <sup>11</sup>	3.11	18.3%
2012	iPhone 5	650 <sup>12</sup>	3300 <sup>13</sup>	5.08	63.3%
2013	iPhone 5s	650 <sup>14</sup>	3200 <sup>15</sup>	4.92	-3.15%
2014	iPhone 6	650 <sup>16</sup>	2350 <sup>17</sup>	3.62	-26.4%
2015	iPhone 6s	650 <sup>18</sup>	3100 <sup>19</sup>	4.77	31.7%
2016	iPhone 7	650 <sup>20</sup>	3250 <sup>21</sup>	5.00	4.82%
2017	iPhone 8	700 <sup>22</sup>	4200 <sup>23</sup>	6.00	20.0%
2018	iPhone Xs	1000 <sup>24</sup>	9900 <sup>25</sup>	9.90	65.0%
2019	iPhone 11	700 <sup>26</sup>	7300 <sup>27</sup>	10.4	5.05%
2020	iPhone 12	800 <sup>28</sup>	11000 <sup>29</sup>	13.8	32.7%

**Mean inflation between 2010-2019 = 19.8%**

**Standard deviation of inflation between 2010-2019 = 30.0**

The smartphone industry has been fairly stable in prices with the premium phones costing around \$1000, medium costing \$500-\$800 and the budget section costing less than \$500. We see that Apple has kept prices around that range over the years.

However, in Turkey, because of the decrease in the value of the Turkish lira, smartphones have become very expensive. Especially in 2020, when the TL hit rock bottom in value. The chip shortages caused by Covid had no effect on this since retail prices stayed the same in the US.

#### **4.8 Apple Laptop:**

In this category, I was unable to find reliable data for the past so I will only be reaching verdicts for the 2018-2020 years, which should be enough for me to understand how Covid has affected the laptop market.

**Table 8**

Year	Model	Retail in the US (\$)	Retail in Turkey (TL)	TL per \$	Inflation
2018	MacBook Air (2018)	1200 <sup>30</sup>	9200 <sup>31</sup>	7.67	-
2019	Macbook Air (2019)	1100 <sup>32</sup>	10300 <sup>33</sup>	9.36	22.0%
2020	Macbook Air (2020)	1000 <sup>34</sup>	11000	11.0	17.5%

For the laptop category, I was unable to find accurate data for the past years, when the prices are compared, even when there was a decrease in the retail price of the MacBooks, the prices in Turkey increased significantly. Once again this is because of the loss of value of the Turkish Lira. Therefore, we can't say it was because of Covid.

#### **4.9 Fossil Watch<sup>35</sup>:**

**Table 9**

Year	Model	Retail in the US (\$)	Retail in Turkey (TL)	TL per \$	Inflation
2018	FS4835	85	765	9.00	-
2019	FS4835	85	870	10.2	11.3%
2020	FS4835	85	1030	12.1	18.6%

For the cosmetic category, I decided to use a fairly common watch that has had the same price over the years. The retail in \$ has stayed the same but because of the receding economy of Turkey, the watch increased in price. This is once again, not related to Covid.



#### **4.10 Red Meat** <sup>36</sup>:

**Table 10**

Years	Price (TL/kg)	IR
2010	23.00	
2011	23.30	1.30%
2012	23.80	2.15%
2013	23.90	0.42%
2014	25.90	8.37%
2015	31.40	21.2%
2016	38.40	22.3%
2017	39.60	3.13%
2018	40.00	1.01%
2019	40.60	1.50%
2020	56.80	39.9%

**Mean inflation between 2010-2019 = 7.51%**

**Standard deviation of inflation between 2010-2019 = 9.13**

Red meat is the staple of protein, it is a necessity for children and adults for further improvements physically and mentally. Unfortunately, it has been a luxury food for people in Turkey because of the high prices. 2015 and 2016 were when there was a major increase in the price, other than those years, even though the prices were high, there was little inflation.

Come 2020, an extraordinary inflation hit, more than 4 times the standard deviation of the past 10 years. Covid had a massive impact on this. Farmers stopped raising cows since the cows' food was getting more expensive. Turkey was importing these foods so when the international gates closed, the prices increased drastically, causing farmers to lose money.

## 5.0 Average Inflation for Each Year

To calculate the inflation of each year, we must first make adjustments to the prices of our products to make the pricing even. For example, a person, on average, wouldn't buy a new car every month, but they would probably eat red meat every week.

-Bread; approximately 1 person eats 1 bread per day, 1 bread is usually 200gr<sup>37</sup>, this leads to the spending of;

**Table 11**

Years	Amount of money spent per year for bread on average by 1 person (TL)
2010	146.00
2011	193.45
2012	208.05
2013	292.00
2014	332.15
2015	372.30
2016	419.75
2017	463.55
2018	547.50
2019	456.25
2020	521.95

-Rice, on average, 1 person consumes 1kg of rice every 2 weeks, this leads to the spending of;

**Table 12**

Years	Amount of money spent per year for rice on average by 1 person (TL)
2010	126.10
2011	120.38
2012	110.24
2013	116.74
2014	169.00
2015	174.20
2016	161.20
2017	180.70
2018	204.10
2019	239.20
2020	272.04

-Gasoline, 30km a day on average, a car on average goes 15km with 1 liter of gasoline.

Therefore 2 liters per day, leads to the spending of;

**Table 13**

Years	Amount of money spent per year for gasoline on average by 1 person (TL)
2010	2825.00
2011	3131.70
2012	3336.10
2013	3650.00
2014	3358.00
2015	3248.50
2016	3686.50
2017	4131.80
2018	4555.20
2019	4489.50
2020	5095.40

-Toyota Corolla, an average person in Turkey buys a new car every 15 years, leads to the spending of;

**Table 14**

Years	Amount of money spent per year for vehicles on average by 1 person (TL)
2010	2753.00
2011	3706.67
2012	3706.67
2013	4023.00
2014	4192.67
2015	4266.67
2016	5146.67
2017	5146.67
2018	6273.33
2019	8500.00
2020	10786.67

-Minimum Wage, I will not include the minimum wage in the calculation of the average yearly inflation. I only wanted to show how the increases to monthly wages are not keeping up with the inflation.

-Water, in my ESS project, I found out that people in Turkey have a water footprint of around 700 liters of water. On average, 300 liters of this 700 is from red meat that is consumed. Therefore, I will be calculating the cost of using 400 liters of water per day. 1 m<sup>3</sup> is 1000L so 400L is 0.4m<sup>3</sup>, leads to the spending of;

**Table 15**

Years	Amount of money spent per year for water on average by 1 person (TL)
2010	343.10
2011	423.40
2012	461.36
2013	503.70
2014	547.50
2015	540.20
2016	569.40
2017	613.20
2018	638.02
2019	661.38
2020	584.00

-Apple SmartPhone, in Turkey, people buy a new phone every 3.7 years on average<sup>38</sup>. Even though some people might buy a more expensive or a cheaper phone, I will be using iPhones since they are one of the most popular phones on the market.

**Table 16**

Years	Amount of money spent per year for smartphones by 1 person (TL)
2010	424.32
2011	545.95
2012	891.89
2013	864.86
2014	635.14
2015	837.84
2016	878.38
2017	1135.14
2018	1872.97

2019	1972.97
2020	2972.97

-Apple Laptop, a laptop is not a necessary piece of tech for many people living in Turkey. You can do most of your necessary work through your smartphone these days. Nonetheless, people in Turkey buy a new laptop every 7.5 years. This leads to the spending of;

**Table 17**

Years	Amount of money spent per year for laptops by 1 person (TL)
2018	1240.00
2019	1373.33
2020	1466.67

Since I don't have statistics for the price of the MacBook for years before 2018, I will create data for it using the average inflation on it during 2018-2020. The average inflation between 2018-2020 is 8.77%. Below is the approximate price of the laptop;

**Table 18**

Years	Amount of money spent per year for laptops by 1 person (TL)
2010	594.84
2011	652.04
2012	714.75
2013	783.49
2014	858.84
2015	941.43
2016	1031.97
2017	1131.21

-Fossil Watch, a wristwatch is not a mandatory accessory for most people in the world, the time can be accessed pretty much anywhere. However, it is still something people buy, in Turkey, people buy a new watch every 10 years on average.

**Table 19**

Years	Amount of money spent per year for watches by 1 person (TL)
2018	76.50
2019	87.00
2020	103.00

Same things with the laptop are also done for the watch, average inflation between 2018-2020 is 16.06% below is the approximate data;

**Table 20**

Years	Amount of money spent per year for watches by 1 person (TL)
2010	18.86
2011	22.47
2012	26.76
2013	31.88
2014	37.91
2015	45.25
2016	53.90
2017	64.22

-Red Meat, as one of the main protein sources, red meat is considered as a must for every person. In Turkey, a person consumes around 12.4 kg of red meat every year.<sup>39</sup>

**Table 21**

Years	Amount of money spent per year for red meat by 1 person (TL)
2010	285.20
2011	288.92
2012	295.12
2013	296.36
2014	321.16
2015	389.36
2016	476.16
2017	491.04
2018	496.00
2019	503.44
2020	704.32

The total money spent in total every year;

**Table 22**

Years	Amount of money spent in total every year (GDP) (TL)	Average Inflation in Total
2010	7,516.42	-
2011	9,084.98	20.87%
2012	9,750.94	7.33%
2013	10,562.03	8.32%
2014	10,452.37	-1.04%
2015	10,815.75	3.48%
2016	12,423.93	14.87%
2017	13,357.53	7.51%
2018	15,903.62	19.06%
2019	18,283.07	14.96%
2020	22,507.02	23.10%



**Mean inflation between 2010-2020 = 11.85%**

**Standard deviation of inflation between 2010-2020 = 7.93**

## 6.0 Evaluation and Conclusion

The economy of a country is affected by many factors. Some factors can be controlled by the government and some can't just like the Covid-19 Pandemic. Nonetheless, some measures can be taken to soften the effects of the unpredictable measures. In this report, I tried to compare the economy of Turkey in the year 2020, when Covid first started to be a big part of our lives, to the other past years by calculating the inflation of nine specific products which in turn, helped me get an estimate of the yearly inflation of the country.

The table below shows the actual inflation rate of Turkey throughout the years.

**Table 23** <sup>40</sup>

Years	Average Inflation in Total
2011	10.45%
2012	6.16%
2013	7.40%
2014	8.17%
2015	8.81%
2016	8.53%
2017	11.92%
2018	20.30%
2019	11.84%
2020	14.60%

**Mean inflation between 2010-2019 = 10.82%**

**Standard deviation of inflation between 2010-2019 = 4.17**

The data is from TUIK, the Turkish Statistics Institution. Their list for the calculation of inflation contains more than 500 items so it is more accurate than my calculations. However, numbers can be manipulated very easily, that is why I found the prices of my items myself and calculated the inflation myself.

### **Effect Size Calculation**

Effect size determines the relationship between two data sets by comparing their averages and standard deviations.

$$\text{Effect Size Formula: } (\mu_1 - \mu_2) / \sigma$$

Effect size calculation for the IR I calculated and the IR calculated by TUIK;

$$\frac{11.85-10.82}{4.17} = 0.247$$

0.247 is a very small effect size which means my calculations of IR are accurate when compared to TUIK's numbers.

The weight of the GDP I calculated comes from gasoline and the vehicle. When there is a dramatic change in the prices of those things, my calculations are affected a lot. That is why there is a big difference between the inflation rate I calculated for 2014 and 2015. However, even though I was only able to use 9 products, I had an accurate representation of the inflation rate over the years. There is only a 1.03% difference in the averages of the inflation rates. But, there is a big difference between the standard deviations of the inflation rates.

When answering the research question, it is seen that both in TUIK and my inflation rates that in 2020, the inflation rate was higher than average. As explained after the calculations of inflations for each product, some of this is due to Covid and some are not. To

completely understand this, you would have to have a degree in economics and know all of the policies and actions of the government. Nonetheless, looking at my own numbers, Covid added an extra 3.32% of inflation at best and added an extra 6.09% of inflation at worst. The best case was calculated by summing the average inflation over the years with the standard deviation and subtracting it from the inflation of 2020. The worst-case was calculated by subtracting the inflation of 2020 from the average inflation of 2018 and 2019.

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