

INTERNATIONAL GOLD PRICES, GOLD RESERVES OF CENTRAL BANKS
AND DEBT STOCKS RELATIONSHIP: ANALYSIS AMONG G8 COUNTRIES



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PLAGIARISM

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

Gold is a commodity that has been used to protect the wealth of not only people but also organizations and states from past to present. For this reason, countries prefer to keep some of their reserves as gold through their central banks.

At the financial macroeconomic level, the primary goal of countries is to sustain a healthy economic growth. However, when the economies of developed countries are examined, especially when the economic growth rate of the G8 countries, which are called the strongest countries class, is examined, it is seen that the public debt ratio is very high, which increases the risk levels of the countries. Therefore, it is expected that the gold reserve demands of these countries will be in a causal relationship with international gold prices. In this study, the causality relationship between the public debt stock of countries, international gold prices and gold reserve of countries is investigated based on this question.

The country sample is based on the quarter between 2008 and 2020 of the G8 country group. The analysis method has been utilized by econometric methods and the relationship between variables has been examined with panel granger causality analysis.

As a result, a unidirectional causality relationship has been found between the debt stock of countries and international gold prices, and between gold reservoirs and debt stock.

Key Words: *International Gold Prices; Gold Reserves of Central Banks; Panel Granger Causality Relationship; Public Debt Stock*

ÖZET

Altın, geçmişten günümüze sadece insanların değil aynı zamanda kuruluşların ve devletlerin servetlerini korumak için kullanılan bir emtiadır. Bu nedenle ülkeler sahip oldukları rezervlerin bir kısmını merkez bankaları aracılığı ile altın olarak saklamayı tercih ederler.

Finansal makroekonomi düzeyinde ülkelerin en öncelikli hedefi sağlıklı bir ekonomik büyümeyi sürdürebilmektir. Ancak günümüzde gelişmiş ülkelerin ekonomilerine bakıldığında özellikle en güçlü ülkeler sınıfı olarak adlandırılan G8 ülkelerinin ekonomik büyüme oranına bakıldığında borçluluk oranlarının çok yüksek olduğu görülmekte bu da ülkelerin risk düzeylerini arttırmaktadır. Bu nedenle bu ülkelerin altın rezervi taleplerinin uluslararası altın fiyatları ile bir nedensellik ilişkisi içerisinde olması beklenmektedir. Bu çalışmada bu sorudan hareketle ülkelerin kamu borç stoğu, uluslararası altın fiyatları ve ülkelerin altın rezervleri arasında nedensellik ilişkisi araştırılmıştır.

Ülke örnekleme olarak G8 ülke grubuna ait 2008 - 2020 arası çeyreklik baz alınmıştır. Analiz yöntemi ekonometrik metodlardan faydalanılmış ve panel granger nedensellik analizi ile değişkenler arası ilişki incelenmiştir.

Sonuç olarak ülkelerin borç stoğu ile uluslararası altın fiyatları arasında ve altın rezervleri ile borç stoğu arasında tek yönlü bir nedensellik ilişkisi bulunmuştur.

Key Words: *Uluslararası Altın Fiyatları, Merkez Bankası Altın Rezervi*

Panel nedensellik analizi, Kamu Borç Stoğu

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INTRODUCTION

From past to present, human kinds have always been interested in gold. Different civilizations such as Romans, Greeks or Egyptians wanted to collect as much gold as possible. The reason behind this had been different usage of gold. Paying for resources or safety - haven in times of war or political chaotic environment could be thought of as some important reasons. Today, it is known that gold is used as an important saving and investment tool, although it has lost its place in the monetary system. It is also known that gold is one of the most important wealth protection tools.

The different factors behind the fluctuation in gold prices and the reasons for the volatility in gold prices are of great importance. In this respect, many studies have been conducted on this subject and different results have been obtained. For example, Dooley, Isard and Taylor (1992) and Sjaastad and Scacciavillani (1996) examined the short and long-term relationship between gold prices and exchange rates, which are thought to affect gold prices. Vural (2003) examined the relationship between gold prices and silver prices, which are thought to affect gold prices, the US dollar, oil prices, Euro rate, copper prices, interest rate and the Dow Jones Industrial Index. Poyraz and Didine (2008), intended to affect the price of gold to the Central Bank's foreign exchange reserves of gold prices in Turkey have investigated the relationship between oil prices and the exchange rate. Menas (2009), the movements in made clear that the gold market study and gold prices in Turkey, which is thought to affect the CPI index, the ISE 100 Index, the real exchange rate index has examined the relationship between real interest rates on deposits and the London gold market in the designated ounce of gold value.

Central banks have been holding large amounts of gold for more than 100 years and are expected to maintain large gold stocks in the future. Central Banks still own approximately 20% of aboveground gold stocks. It is true that the readjustment process of reserve portfolios in order to adapt to changing conditions towards the end of the 20th century experienced a decrease in the amount of gold they hold in some central banks. This process has changed over the last decade. Central banks confirm with the agreement they signed in 1998 that gold will remain an important reserve asset for the near future.

Gold prices are affected not only by central banks but also by countries' indebtedness. Due to borrowing, which is used as a financial instrument by countries today, countries tend to hold gold in their treasury to neutralize their risks, which is thought to increase global gold prices, especially in times of financial crisis. In this context, considering the debt to GDP ratio of G8 countries is more than 70% and these countries constitute more than half of the world economy, it is expected that there will be a relationship between the increase in public indebtedness rates of these countries and global gold prices.

With the light of given information above, the aim of this thesis is to investigate the relationship among gold reserves of central banks, countries debt stocks and international gold prices. In previous studies, gold reserves of central banks, gold prices and countries' debt stocks are analyzed as individual topics; on the other hand, there is not a study that analyzed the relationship among these subjects. Therefore, it is considered that this study will be a pioneer study for the future studies.

In the first chapter, It is planned to give a conceptual framework about this work. First of all, gold will be taken into account. It is aimed to give historical knowledge of gold in the financial system, how the gold market works and how gold prices occur in the financial markets. After, debt concepts will be analyzed. There are two major debt classification; external debt and internal debt. It is aimed to give conceptual framework both of them and ,at the same time, debt stock classification will be analyzed. Lastly, it is planned to make a conceptual framework for the gold reserve of central banks.

Information about previous studies will be analyzed in the second chapter. The main strategy is to give related literature about a group of concepts.

In the third chapter, it will be mentioned the hypothesis of this study and theoretical and econometric framework. For analyzing the relationship among the concepts, it is planned to benefit panel data analysis methods, especially panel causality analysis techniques. For this reason, Granger causality analysis will be applied.

The fourth chapter will include the descriptive statistics, information about dataset and econometric analysis results of the hypothesis. In this chapter, the causality relationship among concepts and direction of the relationships will be analyzed, deeply.

Lastly, reached results after findings will be evaluated and analyzed in terms of related literature review in the conclusion and discussion chapters. Moreover, the possible recommendation will be given the future researchers and related parties in the recommendation chapter.

1. CONCEPTUAL FRAMEWORK

In this part of the study, detailed information about the basic concepts that will be used in the research will be mentioned. In this context, the concepts of gold, borrowing and central banks' gold reserves, respectively, will be mentioned in the literature and important topics will be mentioned in terms of understanding this study.

1.1. Gold

Gold is an easily found metal in nature and it is easy to process because it is soft in nature. It is a metal that attracts attention because it is shiny. Therefore, it has been used in many areas of human life throughout the ages.

It is used in alloy with other metals such as gold, silver and copper. The ratio of gold metal in the alloy to the weight of the alloy indicates the purity of the gold. While this ratio is expressed in thousandths, only 1000/1000 gold is considered pure. Gold bullion traded in the international gold market is usually in the purity ratio of 995/1000. Another system used to show the purity rate is the carat (setting) system. In the carat system, 24 carat gold is 1000/1000 pure. The reason why bullion / gr gold price was used in our study is that the purity ratio of gold, which is subject to both international trade and trade in our country and the stock market, is 995/1000.

Although different units of measure are used in different parts of the world, international gold prices are expressed in ounces. There are many different types of ounces, but the most well-known are troy ounces and avoirdupois ounces. Troy ons got its name from the French town Troy, where it was first used. 1 troy ounce corresponds to 31.103476 grams. In practical use, it is expressed as "ounce" only. Apart from this, it is a very common practice to express the weight of gold in grams or kilograms, as in our country. While 1 kilogram is 32.1507425 ounces, 1 gram corresponds to 0.032151 ounces. In India and some countries of the Middle East, "tola" unit is used (1 tola: 11.6638 gr), while in some Far Eastern countries the unit of measurement called "tael" is used. 1 tael corresponds to approximately 37.51 grams (Göknil, 2003).

Due to its chemical properties, gold has been regarded as superior to other metals throughout human history and has a wide range of uses (Aslan, 1999). It is included in precious metals with the golden au symbol and its usage areas are as follows;

- As an investment tool / As a value storage tool
- In the production of ornaments and jewelery (by adding copper mixture to harden)
- As gold bullion within the reserves of the central banks
- For speculative purposes in the markets
- In the electrical-electronics industry
- In the chemical industry
- In the dentistry
- Computer technologies
- Aircraft industry
- Automotive industry.

Gold is kept in Central Banks foreign exchange reserves for a number of purposes;

- Creating confidence for the markets
- Balancing Rate policies and monetary policies
- exchange Providing the government's foreign and domestic debt service in terms of foreign currency,
- all kinds of reactions from outside or inside the country's economy
- such as maintaining sufficient foreign exchange liquidity against.

In the next section, the historical development of the gold mine, which has such a wide area of use, in the financial system will be discussed.

1.1.1. History of Gold in Financial System

Gold is an item that is highly regarded by the wider society today. However, it is a strategic reserve tool that is still frequently used in the financial system. In this section, the use of gold as money throughout history and its place in the recently developed financial systems will be discussed.

The first time gold was mined and used as money. It dates back to the 5000s and was carried out by Lydians in Anatolia. However, before that, it was used as a means of exchange and jewelry by women during shopping.

Egyptians started to produce items with the gold they obtained. In addition, the Egyptians combined the small gold grains they obtained and thus began to produce large gold nuggets. In the following years, they began to stamp these gold bars. These

gold bars, stamped, were the forerunners of gold coins. Later, this process became a symbol of power for all countries.

Mankind started to discover mines 10-12 thousand years ago and gold managed to attract people's attention in a different way in this process. Egyptians, Assyrians and Greeks used gold in making artworks (Barış, 2006). Sumerians also used gold in their architecture by building gold-plated towers.

After the transition from an economy based on exchange to a value economy, gold became the symbol of power and wealth as well as being the symbol of purity and nobility. In addition, Lydians BC. 560- BC During the reign of King Croesus between the years 547 BC, they obtained pure gold by refining a mixture of natural gold and silver called electrons by chemical means. Thus, Lydians started to produce higher quality gold coins by using the first refining method in the world. Obtaining pure gold paved the way for the refining of other metals and caused the beginning of a new era in world mining (Sertkaya, 2005).

The Byzantine Empire, which was founded in 395, started to issue gold coins. However, trade with the East could not be made due to the increasing gold demand of the Western Christian world. For this reason, the shortage of gold in the European Continent has increased even more.

The idea of "Mercantilism" emerged in Europe in the 15th century. This idea bases the wealth of states on their precious metal stocks (Bilal, 2016). For this reason, European states have embarked on a new colony search to acquire precious metals. Countries such as the Netherlands, England, Spain and Portugal were the pioneers of this trend of thought, and in the following years other European states started to accept this thought. Colonial states, by taking the gold and silver mines they obtained from colonial countries to their own countries, minted metal money and increased the economic wealth of their countries. Again, these colonial states thought that if gold was extracted from their countries, it would cause their economies to weaken, and therefore they implemented protective policies in foreign trade (Eğilmez, 2009).

Countries that have been successful in foreign trade have increased their gold reserves and the developing capital accumulation has paved the way for the formation of capitalism. As a result of these developments, gold has been used as a policy tool after the idea of economy in Europe (Eğilmez, 2009).

1.1.1.1. Mercantilist Period

Mercantilism is the economic system implemented in Europe between the 15th and 18th centuries. Under this system, a country's wealth is measured by its gold and silver stock. If the country does not have its own gold and silver resources, these resources must be obtained through foreign trade. The basic principle is that the gold and silver inflow to the country exceeds the mine outflow from the country. Accordingly, policies such as export promotion and substitution of imports are implemented in order to increase the precious metal presence of the country. In line with this system, leaving the country for gold or silver means the country's impoverishment (Selik, 1998).

1.1.1.2 The Period When Gold Was Used as Money (1870 - 1914)

Until precious metals were found, there was a great variety of instruments used as money. In the first age, slaves were used as money in England. In the Middle Ages, it was very common to use black pepper as money. Also in this period, keeping cattle as wealth instead of utilizing their meat was a practice that continued until modern times. However, no object used as money in history has been widely accepted as precious metals. The presence of precious metals has made it possible to carry out shopping transactions more easily. The most important one among the precious metals used as money was gold (Istanbul Gold Exchange Report, 2008: 5).

In the world economy from the 1870s to the First World War, and even partially to the 1929 world economic crisis (the great depression) after the war, the "Gold Standard" (fixed exchange rate system) formed the basis of the international monetary system. The gold standard was a monetary system that reflected the assumptions of classical economic theory and in which participating countries committed to tying their national currencies to gold at a certain rate. In countries where this system was valid, the national currency could be freely converted into gold at the fixed rate determined. Accordingly, a country that adhered to the gold standard defined its currency in terms of a certain and constant amount of gold.

The main features of this system were the definition of each country's currency in terms of pure gold with a certain weight, and the liberation of the purchase, sale, export and import of gold. The gold standard was a universal system. Since every country included in the system defined its currency with gold in this way, the currencies

of all participating countries were naturally linked to each other. Therefore, with this system, exchange rates between countries were also fixed. If exchange rates exceed or fall below the fixed gold parity, exceeding the cost of moving gold from one country to another, large amounts of gold inflow or outflow from country to country until exchange rates return to the official level. The gold movement that took place within the said mechanism enabled the system to come into balance automatically. However, this system became unsustainable with the beginning of the First World War. The most important reason why the system cannot be sustained is that the countries participating in the war, in order to finance the war or to compensate for the damage they suffered in the war, print paper money regardless of gold exchange (Bordo and Kydland, 1992).

There are also various opinions on the gold standard that bring positive reviews. Accordingly, it is thought that the gold standard has a positive effect on the international trade volume. From 1870, when the gold standard was implemented, to 1910, the international trade volume grew by approximately 30%. Another positive criticism of the gold standard is that the system puts a limit on monetary expansion. Since there is a limit to the expansion of the money supply in the economy in the gold standard regime, it is impossible to affect the general price level with expansionary monetary policies (Müslümov et al., 2002).

In the period in which the gold standard was implemented, with the discovery of new gold mines and technological innovations, world gold production increased in proportion to the increase in production and trade volumes in the world. Thus, foreign exchange convertibility was easily achieved and no liquidity problem was experienced in international payments. In addition, since the countries did not face trade control and restrictions during this period, the world welfare level increased.

After the First World War, the idea of "Classic Gold Standard" dominated. According to this view, the values of national currencies are determined by the amount of gold they store.

Just before the Second World War, the international monetary system became inoperable and the foreign exchange controls implemented with the money blocks established failed. The onset of the war has made it necessary to establish an international commercial and financial system that would liberate world trade and facilitate international payments due to a number of difficulties (increasing tight quantitative restrictions, competitive devaluations and tariffs).

1.1.1.3 Bretton Wood Era (1944 - 1973)

The Bretton-Woods system is the economic and financial system adopted in the town of Bretton-Woods in July 1944. According to this system, the countries involved in the meeting agree on a common monetary order (Egilmez, 2013). On the basis of the system, the orientation of the new monetary system in the world depending on the dollar is accepted.

The aim of the conference is to create a basis for economic cooperation and change that will lead to the international economy that will provide stability and prosperity (Egilmez, 2009).

44 countries participated in the meeting that took place in the town of Bretton-Woods. With this agreement, according to the new system, the standard unit of measure was gold, and the US dollar as the reserve currency was accepted. This new system is called 'Golden Exchange System'. With this system, the International Monetary Fund (IMF) and the World Bank (World Bank) institutions have also come into operation. Among the founding objectives of the IMF are to provide political advice and provide technical support to help countries build strong economies and maintain stability in these economies by ensuring international financial cooperation. In addition, it is among the duties of the organization to provide loans to member countries and to help member countries design policy programs to solve balance of payments problems. The World Bank, on the other hand, aims to support countries to reform in certain sectors or to provide technical and financial support to help them implement certain projects, and to prepare projects that will encourage member countries to develop long-term economic development and reduce poverty.

Since the Bretton-Woods system is very vulnerable to the effects on the dollar and gold, it started to cause problems after 1960, however, it created imbalances in foreign payments to countries (Tabakoglu, 2016) In 1971, as a result of years of speculation on the dollar, the Bretton-Woods system collapsed; The US dollar was separated from the gold dependence and the currencies were left to free float (Guvenc, 2002).

1.1.2. Supply and Demand Mechanism of Gold

1.1.2.1 Supply Mechanism of Gold

One of the most important features of gold is its limited availability in the world. Therefore, it is important to control the gold supply in the markets. The resources used in the gold supply are generally divided into three groups. The most important of these resources and the largest component of the total gold production in the world is the gold mining resource. Gold mining is the largest component of the world's total gold supply, and this resource is provided by mining companies operating in certain parts of the world. Another important source of the world gold supply is scrap gold. The supply of scrap gold is created by refining gold, which is often used in jewelry and electronics making, and then turning it back into bullion. Another important source of the world gold supply is the sale of gold by official institutions. Due to its nature of being a reserve instrument, gold today has an important place in the official reserves of national central banks and international official institutions. These institutions create gold supply by selling their gold as a reserve as a result of periodic developments in the world and in their own countries or because of the policies they have determined before. These official institutions are one of the biggest players in the world gold market due to their high gold reserves. In addition to these three resources that make up the world gold supply, gold sales made by hedging transactions in order to protect companies operating in gold mining from future price decreases are an indispensable part of the world gold supply. Gold mining companies protect themselves against uncertainties in gold prices and manage their businesses efficiently by using these methods, also known as “futures sales” (Atay, 2013: 60).

1.1.2.1.1. Gold Mining

With the increase in technology, today to make gold mine profitable, mined mineral it must contain at least 0.5 grams of gold per tonne from deposits, 3 grams of gold per tonne to mine underground and 1-5 grams of gold per ton for open field mines. . In gold mining, it is often impossible to detect a small amount of gold, so at least 30 grams of gold per tonne is required in the soil for detection. Although a piece of land contains approximately 0.0035 grams of gold, this is not sufficient to obtain gold from an economic perspective. Because to be able to mine gold, there must be about 1 gram

of gold per ton. In this context, gold mining is not a logical choice when this is not the case (Çıtak, 2006: 64; Khan, 2013: 663).

Today, the increase in gold production is associated with increasing costs and increasing gold mining. However, the increase in gold prices does not have an increasing effect on gold production. The cost factor, which is the most important factor affecting especially in terms of production, varies depending on the type of mining above or below. Other factors affecting the production side of gold are the productivity of the mine, the price of gold in the spot markets, the expectations of the producers, the gold processing method used in the production sector, and labor costs (Öz and Fidan, 2013: 121).

Gold mines consist of veins called reefs and two types of sources called sediments or alluviums. Most of the world's gold production is made from veins called "reefs", and excavations in these mines usually contain 6 to 12 grams of gold per ton. These elements, called sediment mines or alluviums, lead to the formation of the second type of mines. These second type of mines are easier to use compared to gold mines excavated. However, these alluviums contain less gold than rocks and their low cost makes them more profitable. Although it is known that there are millions of gold in the seas and oceans as another resource, it is not produced because there is no method to produce them at low cost (Özdoğan, 2008: 31).

Considering gold mining countries, it was known that South Africa was the world's most important gold producer in the 1900s and that South Africa's annual gold production was around 1000 tons in the 1970s, that is, it constituted approximately 70% of the gold production. However, it is known that this advantage of South Africa has been gradually decreasing recently. In the same period, it is known that 252 tons of gold was produced in the USA and 247 tons in China and in addition to these countries, Indonesia and Peru were among the leading countries in gold production. Gold production is increasing in developing countries in the world, especially in countries with high debt, and therefore, it is known that most of the exports of these countries are gold exports (Menase, 2009: 21).

1.1.2.1.2. Scrap Gold

Gold can survive for a long time without any corrosion or deterioration due to its unique properties. In this context, gold, which was released for many years, still preserves its initial strength and can be used unless it is lost. Gold can also be easily

recycled from all uses, meaning that gold consisting of different product components is melted, refined and turned into bullion. In terms of all these, scrap gold supply is an important component of the gold market (Menase, 2009: 29).

1.1.2.1.3. Institutions Authorized for Gold Sales

Another important source that constitutes a part of the gold supply in the world is the sale of gold carried out by the central banks of the countries and the official international financial institutions of the countries. The national central banks of the countries preferred gold as a solid reserve instrument in the period following the gold standard they held in exchange for post-gold standard national currencies. Today, gold continues to be used as a reserve by international official financial institutions as well as national official banks (Atay, 2013: 73). The gold reserve held by the Central Bank of each country varies from country to country, and while this change has close values in some countries, it has great differences in some countries (Kültürçü, 2014: 57)

1.1.2.2 Demand Mechanism of Gold

Gold, which has been accepted by almost all civilizations in human history. Today, it has its own demand conditions as it is both a commodity and a financial asset. Thanks to the great importance that comes from history and people still attach to it today, it is in high demand from many different parts of the world and from many different segments of society. The common belief that it is a good savings guard, especially in the long run, makes gold an important tool in the financial field. However, its physical properties and aesthetic appearance bring gold to the fore as a commodity.

It is possible to basically divide the demand for gold into three different sub-classes. The strongest source of gold demand is the demand for jewelry. The demand for jewelry is followed by industrial demand and investment demand.

1.1.2.2.1. The Demand for Gold as Jewelry

The area where gold is most frequently used is the jewelry industry. In Western countries, especially in developed Western countries, gold, which is a precious metal, is bought and sold as jewelry and ornaments, while it is used in the Middle East and Asian countries to protect and preserve their assets. With this function, gold is important for rural and poor people who do not have access to financial instruments and bank accounts, do not rely on this access or want to protect their money in other environments

than banks. Gold jewellery is very important for women in many cultures because it is accepted as the individual property of women or used as collateral in events such as divorce (Neuberger, 2001: 22-23).

It is known that the demand for gold jewellery is directly related to the economic growth, income level and welfare level of the countries. There is also an increase in the amount of money allocated to gold jewellery by people whose economic conditions are improving and their income level is increasing. It is also known that changes in social factors, fashion, taste and preferences affect the demand for gold jewellery (Neuberger, 2001: 22).

1.1.2.2.2. Demand for Gold as an Investment Tool

The most important reason for demanding gold for investment purposes, which is generally known to come from mutual funds, is the need to make a profit. It is known that in case the forecasts and expectations that gold prices will increase in the market intensify, investors and speculators active in the markets increase their gold demand and aim to make a profit by buying gold from their current levels and selling these gold at high prices that will be realized in line with their future expectations (Akben, 1980: 3).

Gold, which is an important investment tool among other functions, is one of the most preferred investment tools, especially in regions where financial markets are not sufficiently developed and therefore have limited financial product range. Especially in recent times, as gold prices have an increasing trend, the use of gold as an investment tool has increased and it is also subject to gold spot transactions and futures transactions in many different markets recently (Menase, 2009: 40).

It is known that among the factors affecting the investment demand for gold, there are macro and micro balances such as gold prices in international markets, interest rates, inflation rate, economic growth rate, exchange rates, international political tension and the returns of alternative investment instruments (Bordo and Schwartz, 1994: 27).

Gold prices, which are in a downward or upward trend, affect the investors' demand for gold differently than their demand for other goods. As a general belief, the increasing trend of gold prices causes an increase in investment demand for gold, but a downward trend in gold prices causes a decrease in investment demand for gold. Investing in gold takes place in three ways (Erer, 2011: 25):

1. Buying and holding gold directly in bullion or gold coins
2. Investing in gold with a bank account or broker of the gold investor
3. Future-oriented transactions. is to invest.

The interest of those who want to invest in gold is affected by various reasons such as global gold prices, inflation rates, interest rates, economic growth rates of countries, global political tensions, exchange rates and the returns of other alternative investment instruments (Sönmez, 1999: 3334).

On the other hand, the investment demand for gold is increasing because of the macroeconomic conditions in the world, interest rates, expected inflation rates and especially in times of crisis, it preserves its value more than other investment instruments. In addition, stocks or corporate bonds with credit risk and low liquidity risk cause gold to become an advantageous investment tool (Altaş, 2010: 12-13).

Investment demand for gold generally increases when investors' interest in other investment instruments decreases, and decreases when investors' interest in other investment instruments increases. However, gold turns into idle funds when real interest yields negative returns and interest in the stock market decreases. Investors' demand for gold investment also decreases when other investment instruments provide higher returns than gold investment instruments and at the same time when the securities markets are active, that is, gold, which does not generate profit or interest income for individuals, loses the interest of investors during the period of interest in other investment instruments (Sönmez 1999: 34).

Nowadays, those who want to invest in gold often prefer gold bars and coins. For those who want to invest in gold as bullion and money, today there are various sizes and weights of bullion and money. Thanks to these investment options in bullion and coins, individual and institutional investors can easily invest in gold bullion and the money they want (Atay, 2013: 108).

ETFs, one of the other tools that enable investing in gold, offer investors the opportunity to take advantage of the changes in gold bullion prices, while also offering the opportunity to trade in many stock exchanges around the world. Except for other investment-oriented gold demand instruments, such gold demand includes options and futures traded in gold to counter markets. At the same time, gold-based investments other than ETF and changes in the stocks of industrial and jewelery companies are also evaluated in this context.

1.1.2.2.3. Industrial Demand

It is known that gold, which has superior physical and chemical properties such as resistance to chemicals, resistance to oxidation, corrosion, high thermal and electrical conductivity, being reflective, easy to process and permanent, is widely demanded in the industrial field. (Aslan, 1999: 4). It is known that gold, which is known to be quite expensive, is still used in the aviation and space industry and is also used in the production of electronic devices such as convectors, switches and electricity due to its corrosion resistance and high conductivity (Sönmez, 1999: 25).

Because gold is a biocompatible material, it is used in medical implants and since it is opaque to x-rays, it is placed with great precision for surgeons to place stents. At the same time, gold is used in these instruments due to its high reliability in other medical implants containing gold, pacemakers and insulin pumps and microelectronics (World Gold Council, 2019).

Gold, which has been used in dental production since ancient times, is in intensive demand until the first quarter of the 1970s due to its adaptability to the oral mucosa and the lack of any other alternative. Since the last quarter of 1970, the amount of gold used in dental production has started to decrease gradually with the practice of preventive dentistry, which has become widespread especially in developed countries (Erer, 2011: 274). In the electronics industry, as in the jewelry industry, manufacturers have tried to reduce the amount of gold used in their products due to the rise in gold prices. Due to technological developments, some electronics manufacturers have started to use palladium-nickel alloys instead of gold, and they have thinned the gold that they use in plating various items. Another reason why the amount of gold used in the electronics industry has not increased much is the decrease in the size of many electronic circuits and products (Erer, 2011: 23-24).

1.1.3. Important Gold Markets in The World

As gold is a strategically important commodity and an international reserve tool, it is seen that gold exchanges in many markets around the world are structured separately from commodity exchanges. These are the so-called gold and precious metals exchanges (Gold-Precious Metal Exchange) and are universal exchanges operating 24 hours a day. Major gold exchanges have the most weight among the world stock exchanges:

- London Gold Exchange
- Zurich Gold Exchange
- New York Gold Exchange
- Hong Kong Gold Exchange
- Tokyo Gold Exchange

1.1.3.1. London Gold Market

London has been the center of the world gold trade for years. NM Rothschild, the sole representative of the Bank of England, obtained South African gold from a single source and at a fixed price until the end of the First World War. The London Bullion Exchange, which was established in 1919 with the participation of five British companies (NM Rothschild, Mocatta Goldsmid, Johnson Matthey, Sharps Pixley, Samuel Montagu), continues its activities today outside of Johnson Matthey. The most important effect of this exchange in the world gold trade is fixing (price fixing) (Coskun, 1988: 55).

The most important advantage provided by the fixing process is that it creates buying and selling prices within a very narrow range. A simple gold price emerges for this simple market. The fixed gold price is a price formed by the participation of high volume gold buyers and sellers around the world. The success of the New York Gold Exchange in futures gold transactions led to the establishment of a futures gold exchange in Europe. Thus, the London Futures Gold Exchange was established on April 19, 1919 (Green, 1993: 235-241).

1.1.3.2. New York Gold Market

Until 1971, a fixed gold price was applied in the United States under the Bretton Woods Agreement. Until this date, gold trading was prohibited. The abandonment of the fixed gold exchange rate in 1971 and the removal of restrictions on gold in the following years stimulated the gold trade.

With the lifting of the bans, The New York Commodity Exchange and New York Mercantile Exchange, which were previously established, started gold trading. Today, these two exchanges make up 96% of the trading volume of gold exchanges in the USA. 85% of this ratio belongs only to the New York Commodity Exchange. These two exchanges are the world's largest gold futures exchange (Istanbul Gold Exchange, 2000: 24)

1.1.3.2. Zurich Gold Market

Zurich is one of the most important physical gold centers today. Because it is known that gold from South Africa and former USSR countries is more than half of the world gold consumption. Switzerland is the country with the most reserves in the world, after America, France and Germany. The Swiss banking system has enabled Switzerland to become one of the important centers for gold trading. The estimated annual gold trade in Switzerland is between 80-100 billion USD. The Zurich Stock Exchange is based on the gold price announced daily by three banks (Credit Suisse, Swiss Bank Corporation, Union Bank of Switzerland) and adopted as the official Zurich gold price for gold transactions. However, according to demand, buy and sell transactions are carried out within a margin of \$ 3-4 per ounce. The minimum purity rate for gold traded on the Zurich Gold Exchange is considered to be 99.5%. It is essential that the standard gold bar weight is between 350 ounces and 430 ounces. Payment or delivery for the completed transactions must be made within two days. A commission of 0.2% is charged only for buying transactions (Cılız, 2010: 114).

1.1.3.3. Hong Kong Gold Market

Hong Kong is the center of the Far East gold trade. Gold trading was prohibited in Hong Kong until 1974. However, there is a gold exchange that dates back to 1910 and is managed by an association. Both the Continent because of China's gold production increased and both lived in the Far East in recent years, economic development, especially switching to invest in gold in large quantities from Taiwan and Japan, led to the revival of the Stock Exchange of Hong Kong (Green, 1993: 282-286)

Hong Kong Stock Exchange price-fixing works without doing. Hong Kong Stock Exchange has an important regional position in terms of 24-hour gold trade. The closing time of the American Stock Markets coincides with the opening time of the Hong Kong Stock Exchange, and the closing time of the Hong Kong Stock Exchange coincides with the opening time of the Zurich Stock Exchange. In this respect, European and American speculators find a good arbitrage opportunity in the Hong Kong Stock Exchange. (Green, 1993:282-286)

1.1.4.3. Tokyo Gold Market

Tokyo Gold Exchange was established in 1982, and commodity exchanges joined the Tokyo Commodity Exchange in 1984. In this exchange, precious metals (gold, silver and platinum), rubber, cotton yarn and wool yarn are traded at the same time. Tokyo Commodity Exchange is affiliated with the Japanese Ministry of Industry and International Trade (Green, 1993: 287-289).

1.2. Debt

Debt is expressed as a liability that must be fulfilled after borrowed and received to be returned; Borrowing is the borrowing of money and similar values to be repaid after a certain period of time. What is meant by public borrowing is the legal obligation of the state to make interest and principal repayment to the owners of predetermined rights at a specified time (Ulusoy, 2009: 1). Today, government borrowing is of great importance, whether in developed, developing or underdeveloped countries. Countries reaching their socio-economic goals, the development in international financial and economic relations and the increase in the functions of the state have brought borrowing to the forefront as a source of financing that can always be applied. For this reason, borrowing has lost its feature of being an extraordinary source of income and has gained an ordinary appearance that can always be applied (Akdoğan, 2009: 452).

In the insufficiency of financing used in public expenditures, borrowing can be used as an alternative to tax revenues. In cases where government revenues are insufficient, borrowing can be used for making investments or due payments. However, these debts also have important effects on the economy. As a result, the repayment of these debts taken by the state is made with tax revenues. The tax burden imposed by the state can affect both the period of time the tax is paid and the future periods. In other words, borrowing; is to use the tax revenues that are planned to be collected in the future (İnce, 2001: 6).

Borrowing used as a financing tool in meeting public needs; It can be done from private individuals as well as from organizations or foreign financing sources (Saatçi, 2007: 94).

Although it is a temporary financing source, borrowing is used as an effective financing tool as well as it is important. The debt instrument can be used for short-term expenditures, as well as for financing long-term government investments and meeting

all public expenses. Besides, it is important that the situation of financing public deficits through borrowing is temporary. Continuous and increasing borrowing situation may have negative effects on the economy (Kaya, 2010: 5).

The government can obtain its borrowing needs from domestic residents as well as from foreign institutions and organizations or funds. Therefore, the concept of state or public debt is divided into two as “domestic debt” and “external debt”. In this section, both concepts will be discussed in detail.

1.2.1. Internal Debt

Another tool utilized in financing public deficits is domestic borrowing. Domestic borrowing is the borrowing of the government or the unit authorized to borrow, in national currency, to individuals and institutions within the borders of the country. In other words, domestic borrowing is the transfer of a part of the national income that can be used from private enterprises, individuals and public institutions to the state or to the public institutions authorized by it (Gök, 2003, p. 119). Domestic borrowing has an extremely important place in government borrowing. Because it is easier for the state to borrow from financial markets compared to foreign markets.

Domestic debt payments do not cause a decrease or increase in GNP. Because it refers to the transfer of a part of national income from individuals, private enterprises and public institutions to the state or to the public institutions authorized by it (Eker & Meriç, 2005, p.83).

Domestic borrowing is a method used in addition to taxes in cases where taxation is insufficient or tax collection takes time, but it is an economic policy tool used as an alternative to taxes when taxation is possible, but due to the difference of short-term effects. However, domestic borrowing is a method used to withdraw the excess money from the domestic markets and to prevent inflationary pressures by taking the surplus cash of the public, creating a restrictive effect on spending. Therefore, the state does not always resort to domestic borrowing because of its financial need. In order to eliminate the instability in the economy, it can also apply to domestic borrowing as a financial tool (Özbilen, 2012, p.25).

In addition to the convenience it provides to the government, domestic borrowing also has some downsides. Covering the interest payments of domestic debt, which is used as an open financing method, from the budget creates a situation that feeds the deficits. This situation causes an increase in interest rates and a shortening of

terms. The pressure created by domestic borrowing on interest excludes private investment. This will cause an increase in investment costs as well as slow down growth. In addition, the size of domestic borrowing and interest payments causes injustice among income groups and causes domestic savings to shift to non-investment areas (Yılmaz & Cural, 2010, p.4).

1.2.1.1. Reason of Internal Debt

It is possible to summarize the main reasons for resorting to domestic borrowing in financing the deficits arising as a result of public expenditures as follows (Erdem, 2006: 43).

- the imbalances between government revenues and expenditures in terms of time Domestic borrowing is used in order to eliminate.
- Domestic borrowing is resorted to when increasing existing tax rates or introducing new taxes creates economic, technical or political difficulties.
- Domestic borrowing can be used as a financial tool to combat imbalances in the economy.
- Public sector financing deficits, especially in economies, in countries where the public sector is dominant, direct governments to domestic borrowing.
- If the state lacks the means of repaying the domestic debt due, it applies to borrow again in order to pay the old debt.

With all these aforementioned reasons, before applying for domestic borrowing, it is necessary to examine the economic and political environment in the country and act in accordance with the general conjuncture. Unnecessary borrowings may cause negative effects on the country's economy. For this reason, before applying for domestic borrowing, it is an important element to examine the requirement of the necessary government debt and decide whether to go for domestic borrowing. During the borrowing process, it is necessary to focus on the effects of this borrowing on the country's economy and to increase production by using this tool effectively, accelerate the development and create effects that protect the economic balance in the country. It is important to use the lent funds obtained through borrowing consciously and manage them in a way that will stimulate the economy.

1.2.1.2. Classification of Internal Debt

Domestic debts are mostly classified according to their maturity, will to lend and debt securities. The classification of domestic debt is outlined and explained below.

1.2.1.2.1. Classification Basis on Debt Resources

The Treasury generally issues Government Debt Securities (GDS) to finance public deficits. In this regard, the state's domestic debt resources finance public deficits; Central bank, banks and insurance companies, individuals and social security institutions.

A) Borrowing Through the Central Bank

Borrowing from the Central Bank is one of the financing resources that the state can apply easily in public borrowing. However, if the Central Bank cannot function as a fully independent institution, it is inevitable that these resources will be used more frequently. Unlike other sources, the amount of debt needed by the state is printed by the Central Bank.

The government's use of such a source of funding causes different effects depending on the different periods of the economy. The Central Bank has a separate role in government borrowing. In principle, the Central Bank is not separate from other banks in terms of buying bonds. However, the debt is credited to the Central Bank account. In order for the state to spend this money, this will lead to an increase in deposits in commercial banks, so the expenditures made by the state by borrowing will also create purchasing power in the market. Thus, newly created funds in the Central Bank increase the lending power in other banks (İnce, 1996, p.60).

Borrowing from the Central Bank takes place in two ways: direct and indirect borrowing. Direct borrowing is the direct cash borrowing of the Treasury from the Central Bank. This is called monetary advance or Treasury advance (Eğilmez, 2006, p.72). Treasury's direct borrowing takes place in 3 ways: First, through treasury bills; secondly, by advances against gold and foreign currency; The third is through a short term advance. Indirect borrowing is by discounting or selling bonds with Treasury Surety to the Central Bank or by receiving advances in return for these bonds. In this

practice, the treasury does not directly borrow, but allows some public institutions to issue and sell bonds as a surety (Açba, 1991, p.151). In other words, it occurs by purchasing treasury papers issued by the Treasury for borrowing by the head office through open market transactions (Egilmez, 2006, p. 72).

The Central Bank is an important source of short term domestic debt. The state gains the opportunity to both support the central bank with the short-term borrowings it needs frequently, and also makes the necessary control over the economy with this new purchasing power created (Özbilen, 2012, p.66).

B) Borrowing from Banks or Insurance Companies

The state can borrow from both the Central Bank and deposit banks, insurance companies and private finance institutions for any reason. Banks operating in the financial sector in our country can be divided into four basic groups (Erol, 1992, p.77):

- Banks established with subsidiaries and special laws,
- Commerce (Deposits) Banks,
- Development and Investment Banks,
- foreign banks and

the State, the expenses made by the Commercial banks are one of the most important sources of domestic loans to cover. Banks are financial institutions with large reserves that can affect the money market. Therefore, banks have become the most important domestic debt source for developing countries due to their low savings levels (Bayraktar, 2011, p.3).

Banks can buy government bonds of their own accord. Especially in times of stagnation in the economy and inactive credit transactions in banks, banks can benefit from interest by depositing their excess reserves in government bonds and bills. Sometimes, the state may seek ways of selling bonds to banks in order to prevent inflationary trends (Erdem, 2009, p.45).

On the other hand, insurance companies and partnerships can invest the legal reserves they reserve in our country in accordance with the provisions of the Commercial Code, and in this way, they can turn their reserves into an income-generating state (İnce, 2001, p.83). As can be seen, insurance companies do not differ from banks in terms of supporting government borrowing. Insurance companies may direct the accumulated and idle funds to securities such as government bonds, treasury bills or revenue sharing certificates (Erdem, 2009, p.45).

C) Borrowing from Individuals

Borrowing from individuals takes the form of issuing long-term government bonds and borrowing money from savers. In this way, private savings held by individuals are transferred to the public. The source of the money borrowed from individuals in borrowing is also an important issue. Because when individuals give loans, they give up their consumption or savings. The fact that debts caused a decrease in saving and consumption varies according to the marginal saving and consumption trends of the income groups from which the debts are borrowed (Eker, 1999: 239). In this way, individuals lending a certain portion of their resources to the public means that private consumption is delayed for the amount that is lent. In order for this delay of consumption to occur, the return of the debt to the government must be at a level to meet the losses caused by the delay of consumption. (Erol, 1992, p. 63).

Ç) Borrowing from Social Security Institutions

The state can provide resources not only from individuals but also from productive public institutions and organizations. Especially institutions and organizations that collect certain funds or deductions in a semi-compulsory or compulsory manner may lend their large amounts of accessing funds to the state or other institutions and organizations (Oskay, 2004; 37). These organizations; are social security institutions. Social security institutions, in particular, hold huge amounts of funds to both provide regular income for individuals and protect them from various risks.

1.2.2. External Debt

Borrowing can be obtained from internal sources or from external sources. According to this; Resources provided by people and organizations residing in the country from abroad in various ways are defined as external debt (Aysu, 2007: 4).

1.2.2.1. Reason of External Debt

External borrowing increases the amount of resources available in a country to be used at certain times, but creates responsibilities that require more exports in the coming years. In this way, borrowing is beneficial for developing economies (developing countries) that have limited levels of foreign currency and need imports of capital goods for economic development. If capital goods help increase the pace of economic development, the increase in output will facilitate the repayment of principal

and interest. The main reason for the state's borrowing stems from the inability of the state's income sources to cover the expenditures. In other words, the main reason for borrowing is budget deficits. The fact that the budget deficits have various reasons means that borrowing occurs for various reasons (Şeker, 2006: 80).

The state and / or institutions tend to borrow for very different reasons. Foreign borrowing because of insufficient savings in the country or foreign borrowing provides capital inflow to the country in terms of foreign exchange return and increases purchasing power is seen as a more attractive financing tool for countries, especially. Since the resources obtained through external borrowing increase the total investments of the country in the year of borrowing (Ay, 2013: 219), countries that do not have sufficient domestic savings to reach the targeted development speed, have limited export opportunities and cannot attract foreign private capital countries are in search of foreign resources (Ay, 2013: 219). Snow, 2012: 110). It is possible to list the internal reasons (dependent on the borrower countries) that states tend to foreign borrowing as follows:

- Industrialization and development goals for which large amounts of financing are needed,
- Desire to overcome difficulties in financing imports of raw materials, intermediate and investment goods in order to realize production,
- Efforts to protect the value of the national currency,
- Country Insufficiency of domestic savings,
- Willingness to become a country open to short-term capital flows,
- Meeting the financing of extraordinary expenditures (war, natural disaster, etc.),tend to
- Paying due debts,

Listing the external reasons (independent from the debtor countries) that statesforeign debt as follows possible (Gorniewicz, 2009: 55-56):

- Unfavorable trade conditions and trade foreseen in international agreements liberalization requirements
- , Protectionist policies on the markets of developed countries,
- Changes in interest rates and loan opportunities with favorable opportunities,
- Krediilend It is related to growing conditions and reduced foreign capital flows.

Countries prefer foreign borrowing because there is a limit where the government can increase taxes to finance public expenditures, and domestic borrowing

instruments such as treasury bills and government bonds have higher interest rates. States; Objectives that it deems necessary, such as achieving socio economic goals, achieving developments in international financial and economic relations, and wanting to be effective in international markets, reveal the obligation of states to increase public expenditures (Kalenderoğlu, 2006: 231).

1.2.2.2. Classification of External Debt

It is possible to classify external debt according to their sources, term, usage and repayment method.

1.2.2.2.1 Classification Basis on Debt Resources

The classification made in terms of the lender or provider can generally be divided into two groups. These are official external borrowing and private borrowing.

A) External Debts According to Usage Types

External Debts can be classified into three subgroups according to their usage. These are project and program loans, freelance and dependent loans, debt suspension and Refinancing Loans.

Project credits are given for the realization of investment projects, while program credits are generally given for financing the imports of the borrowing country (Uluatam, 2003: 431).

Project loans are loans to meet the external financing needs of various public sector projects present in development plans and annual investment programs. Project loans are dependent on the project, and project loans may sometimes be provided to cover national currency-related expenditures as well as external financing of the project. With the project loans, the purpose for the country receiving the loan is to provide the financing deficit needed to turn the project into investment and to transform the project into investment. The lender, on the other hand, will want to strengthen its own industrialization structure by increasing its exports to this country by creating purchasing power in the borrowing country (Zerenler, 2004: 3).

The economic gain of program loans is proportional to the degree of commitment, form and size of their financing. The country benefiting from the property and country-dependent program financing can use it as a tool to improve its own production and exports. In addition, since program loans are considered annually, these

loans may vary according to the conjunctural situation of the economy (Aksu, 2007: 14).

Loans linked to a source or a specific project are completely free loans. Such loans are less common in practice (Zerenler, 2004: 3).

Free loans are a type of loan that is not linked to any project. It is the unconditional loans offered to use in developing economies. Countries using these loans have the opportunity to obtain the goods and services they need for development financing from international markets under the most favorable conditions and in the cheapest way (Zillioğlu, 1984: 26).

There are also various forms of tied loans. If it is stipulated that the financing provided is used within the borders of the country giving the loan, this is basically called dependent loan or loans linked to the source. Loans granted on the condition that they are used in the importation of certain goods are called commodity-related loans. Sometimes, it is stipulated that the loans will be used both in the country giving the loan and in the import of certain goods, which are called country or property-dependent loans (Yücesan, 2011: 21).

Postponement of debt is the deferral of a debt to later years at a lower interest rate than it is due when it is due. Refinancing loans, which are synonymous with deferred debt, are loans taken to cover the outstanding debt, even though it is due. To put it more clearly, the deferral of the payment of an expired debt to the following years with a lower interest rate compared to the first loan interest, the payment of the debt that has expired and the reopening of the same amount of loan is called the refinancing loan (Kozalı, 2007: 14-15.).

According to Kalenderoğlu, re-financing means the debt being paid by debt. In other words, deferring a debt that is due is that the creditor country lends the debtor country the same amount with a contract again. However, debt postponement is the postponement of the existing debt to the future periods with a more suitable interest (Kalenderoğlu, 2006: 143).

An important reason for deferring debt is to prevent social and economic crises in the debtor countries, while it also eliminates the difficulties in the payment of debt repayments, principal installments and interests. It is inevitable to accept the obligations of countries that cannot pay their debts as a result of going to moratorium or not going to moratorium, causing depression in their domestic policies and contrary to the interests of the creditor country (Ulusoy, 2004: 61).

B) Private Originated External Debts There

are private foreign institutions, organizations or persons in private borrowing instead of the state or an international financial institution (Olcara, 2013: 15).

These types of borrowings can be used in various ways as instruments of international financing and for short, medium and long term. Maturity, amount, payment terms etc. of debts to be given. Other costs are determined entirely by assessing the risk levels of developing countries. Nowadays, it can be said that foreign borrowing has become privately sourced due to the emergence of developed financial markets. While the weight of officially sourced foreign debt in total foreign debt was higher in the beginning of foreign borrowing in our country, the ratio of private borrowing in total debt has become higher in recent years. The main reason for this can be shown as the liberalization of capital movements on a global scale (Yücesan, 2011: 19).

C) Officially Sourced External Debts

Official originated external debts can be classified as bilateral or multilateral loans. There are two countries, which are helping and receiving aid in bilateral loans. These two countries in question make an aid agreement between them. The agreement covers the amount, term, interest and other terms of the aid. These types of loans and agreements are generally low-interest and long-term. Loans obtained from various international economic and financial institutions are also called multilateral loans. The World Bank is one of the leading institutions that provide multilateral loans for development and growth (Kozalı, 2007: 12).

A loan obtained by a government from another government is a loan that that government has permission to use on the lender's account. In other words, the government that borrows the expenditure will make the payment by the lender. The borrower is usually the weak side. Its interests are also clear; an urgent import of the country, an infrastructure or external financing of an industrial facility project. The lender is the strong side. The main purpose of borrowing from the state to the state is political (Gülçeri, 1993: 203).

1.3. Gold Reserves of Central Banks

1.3.1. Reason Why Central Banks Holds Golds, Advantages and Disadvantages of Holding Gold For Central Banks

In 1971, after gold was monetary system, many central banks used gold as a legacy of the gold standard and the gold-exchange system era, as developed countries already held large amounts of gold in their reserves. continued to have. Therefore, one can talk about the habits of holding gold in reserves from the past. This may also be due to the lobbying activities of gold producers to prevent this, as they fear that prices will decrease if central banks sell gold. Another trend is that central banks want to prevent price fluctuations by acting together (Bordo and Eichengreen, 1998: 28).

Alan Greenspan, who was the head of the American Central Bank (FED) for nearly 20 years and whose impact on the world monetary policy is indisputable, used gold as a global currency, payment instrument, long-term protection tool that does not need the credibility and credibility of any authority behind it. He stated that it is a final insurance policy. Emphasizing the recent economic situation of America, Europe and England, he stated that if the gold standard were valid, developed countries would not be under excessive debt burden compared to their national income as they are today, because the gold standard would balance the budget deficits. In this sense, he added that fiscal policy comes before monetary policy, it is essential. He stated that the applicability of monetary policy depends on fiscal policy (World Gold Council, 2017: 12 - 14).

Today, gold is seen by many central banks as a reserve asset that must be in official reserves and managed. The most important reason for this can be stated that no person or country has an obligation to gold. Unlike any currency, gold is not affected by countries' economic conditions, policies, or inflation. It provides diversification as gold in the reserve portfolios of central banks is negatively correlated with the US dollar and has low correlation with other financial assets. Throughout history, gold has been a safe asset and a safe haven, whose value has increased in times of financial instability, crisis and uncertainty. After the 2008 Global Financial Crisis, the credibility of the US dollar was shaken, increasing the trust and demand for gold. However, holding gold in reserves is also costly. Because its return is very low compared to other financial instruments (Lawrance, 2003: 23 - 24, World Gold Council, 2016).

Another reason why central banks hold gold is the protection feature of gold against inflation. In times of high inflation compared to periods of low inflation, gold is preferred by central banks to diversify the portfolio. While the tendency to hold gold was high during the high inflation periods in the 1970s, this trend decreased in the low inflation periods of the 1990s. After the 2008 Global Financial Crisis, as a result of the

monetary expansion initiated by the American Central Bank (FED), the European Central Bank (ECB), the Bank of England (BOE) and the Bank of Japan (BOJ), the global money supply and consequently liquidity increased, which means future inflation expectations. gold prices also increased rapidly. In some studies related to this, it has been shown that gold has protection against inflation. Accordingly, it has been observed that gold prices do not increase much in low inflation periods and the return is limited, and in high inflation periods, the return is high with high price increases. Professor Roy Jastram conducted the first statistical study in this area in the 1970s and showed the positive correlation between gold prices and the American consumer price index (World Gold Council, 2009: 6-15).

Focusing on gold in reserves will bring some advantages for central banks. These; Due to the negative correlation between gold prices and the value of the US dollar, the risk of weakening the US dollar is eliminated by the increase in gold prices, therefore, gold has protection against inflation and is a value accumulation tool, and gold can be converted to liquid very quickly when desired (Kodalak, 2018: 117).

Although gold is seen as a commodity, it is actually a financial asset with high liquidity, even money-like, even in times of financial crisis. Gold is an ideal asset, as it has a negative correlation with many investment instruments and minimizes losses by diversifying the portfolio in times of crisis or financial pressure, and the return of other investment instruments is positive rather than negative. The relative performance of gold and other asset groups in the face of the 2008 Global Financial Crisis can give us an idea about this. Accordingly, after the crisis, it is seen that while the return of all assets and investment instruments except gold and US debt securities was negative, gold performed positively. When we look at the comparative performances of gold and other asset / investment instruments in different crisis periods that broke out prior to the 2008 crisis, it is seen that the performance of gold in almost all crisis periods shows a positive performance unlike other asset / investment instruments. When looking at the performance of gold compared to other investment instruments in reserves with one-year, five-year and ten-year maturities, it is seen that it provides higher returns than all of them (World Gold Council, 2011: 4 - 8)

1.3.2. The Effect of Central Banks' Gold Reserve Policies on the Gold Market

Today, central banks and some international organizations such as the International Monetary Fund (IMF) and the Bank for International Settlements (BIS)

hold a significant amount of gold. The inclusion of gold in bank reserves dates back to the classical gold standard period in the 1870s. The amount of gold in central banks' reserves was around 38,000 tons, the highest level in the 1960s. However, after the removal of gold from the international monetary system in the 1970s and with the transition of the countries to the free exchange rate regime, some countries decided to exclude some of their gold from the reserves, thinking that the high gold stocks in the reserves would no longer be needed (Kodalak, 2018: 120).

The incentive of central bank managers to earn returns due to falling gold prices was also effective in the trend towards selling gold reserves. Among the countries that went on sale, America took its place with sales of 500 tons in total in 1975, 1978 and 1979, the IMF with the sale of one-third of its stocks, and Canada with sales in the early 1980s. While this trend continued in the 1980s and 1990s, it was observed that this process harmed the stability of the market by pulling gold prices down. At the same time, the value of gold reserves of countries with high foreign debt at that time decreased. Therefore, with the planned first Central Banks Gold Agreement (CBGA1), which will cover a 5-year period, which was signed in September 1999 and known as the Washington Agreement, the central banks of Western European countries (ECB and the central banks of 14 other countries) will continue to have an important place in the reserves. By stating, they started controlled gold sales. But particularly serious reduction in sales in 2008-2009, while China, India, unlike in developing countries such as Russia and Turkey have turned to gold purchases. Thus, in the 2009-2010 period, world central banks became net buyers for the first time in the last 20 years. This was due to the fact that the role of the US dollar as an international monetary reserve started to be questioned with the 2008 Global Financial Crisis and its hegemony was shaken, and the increasing tendency of the central banks to reduce the weight of the dollar in reserves and to turn to alternative reserve assets was effective (Dempster, 2009: 3-5, Karunagaran , 2011: 15)

2. LITERATURE REVIEW

In this part of the research, the related literature will be introduced. When introducing the related literature, it is mainly focused on determinants of gold prices

due to the lack of study on the relationship between debt stocks and gold prices of countries.

Smith (2001) examines the relationship between gold prices and the stock market price index in his study, and the data consists of daily, weekly and monthly data starting from 1991 to 2001. In this context, four gold prices and six stock market indices were included in the study, and as a result of the analysis, it was concluded that the relationship between the gold price and the stock market price index was a short-term relationship.

Smith (2002) examines the short and long-term relationship between gold prices and stock market prices in his study, and the data consists of data between the years 1991-2001. In this context, three gold prices and eighteen stock market indices were included in the study, and as a result of the analysis, it was concluded that there is a weak and negative relationship between gold prices and the stock market price index in the short term, but not a significant relationship in the long run.

Ghosh et al. (2002) examines the factors affecting gold prices in their study, and the data consists of monthly data between January 1976 and December 1999. Many variables such as US inflation, world inflation, gold lease rate, interest rate and the US dollar have been used as factors affecting gold prices. In this context, VAR analysis was conducted to determine the affected variables of the variables. As a result of the VAR analysis, it is concluded that gold prices are affected by US inflation, US dollar and interest rate. In addition, Engle-Granger cointegration analysis was conducted to examine the long-term relationship between variables. As a result, it has been concluded that there is a long-term relationship between US inflation and gold prices.

Vural (2003) examines the factors affecting gold prices in his study, and the data consists of monthly data between the years 1990-2003. Kutan and Aksoy (2004) examine the effect of the consumer price index on the gold market returns and volatility in their study, and the data consists of monthly data between 1996 and 2001. In this context, the generalized autoregressive conditional variance (GARCH) model was used to examine the effect of the consumer price index on gold market returns and volatility, and as a result of the analysis, the consumer price index had a significant effect on gold prices. As a result of the study, he concluded that CPI does not have a statistically significant effect on gold prices.

Capie, Mills, and Wood (2005) examine the extent to which gold can be used as a hedging tool in the exchange rate, and the data consists of weekly data between

1971 and 2004. In this context, the study uses the pound / dollar and the dollar / Japanese Yen within the scope of the exchange rate, and as a result of the analysis, it has been concluded that there is a strong negative relationship between the movements in both exchange rates and the movements in gold prices, so that gold can be used as a protection tool.

Menase (2009), in activity for this study made clear that the gold market and gold price in Turkey is examining the factors affecting data 1995 - consists of monthly data from 2008. In this context, the factors affecting the price of gold in Turkey working CPI index, the ISE 100 Index, the real exchange rate index, real interest rates on deposits and variables are used in gold ounces value determined in the London gold market in regression analysis. As a result of the regression analysis, it was concluded that inflation, exchange rate, interest rate and stock market index were statistically insignificant, and the gold ounce price determined by the London gold market increased gold prices by 96%.

Elfakhani et al. (2009), aimed to investigate the determinants of gold prices by extending Kaufman – Winters (1989) models. In their research, the Kaufman- Winter model was modified by considering gold supply and demand as well as stock market by taking the 1971 – 1988 period. The result of this study shows that gold prices were mainly determined by central banks' sales of gold reserves, stock market activities, the value of US dollar and gold production-fabrication activities. In addition to this, the study shows the timeline is also an important factor to investigate the determination of gold prices.

McManus et al. (2009) aimed to model gold prices with stock prices of gold mining companies and broad stock market indices. First of all, the cointegration relationship among these variables was found as statistically significant. As a result of the vector error correction model, gold and large-cap stock price indices have causality relationships in long-run and large-cap stock prices and gold prices have a short-run unidirectional causality relationship.

Sadeghzadeh and Eren (2012), in their study, examines the effect of the fluctuations in gold prices on the gold mining sector and also on the stock returns of gold-processing companies, and the data consists of daily data between July 2011 and June 2012. In the study, the relationship between variables is investigated with the integrated analysis, and it is concluded that there is no long-term relationship between the variables.

Ciner, Gurdgiev, and Lucey (2013) examine the relationship between US gold prices, UK gold prices, stock, exchange rate, oil prices and bonds in their study, and the data consists of daily data between 1990-2010. As a result of the study, it was concluded that these investment instruments can be used interchangeably and gold prices can be a safe investment tool, especially against the exchange rate.

Lili and Chengmei (2013) tried to investigate drivers of gold prices in the New York Gold Exchange Market by global macroeconomic indicators, financial market indices, quantities and prices of energy products. As a result of the study, factors affecting gold prices can be classified into three categories; gold reserves and prices of energy products, financial market indices and global macroeconomic indicators. Furthermore, financial market indices and macroeconomic indicators affect gold prices negatively and prices of energy product and gold reserves affect gold prices positively.

Sefa (2013) examines the factors affecting gold prices in his study, and the data consists of monthly data between January 1996 and December 2012. In this context, the London gold market gold ounce price, oil prices, Dow Jones index, time deposit rates, ISE 100 index, consumer price index and the US dollar were used as factors that are thought to affect gold prices. In the study, the relationship between variables is analyzed by the Engle-Granger test, and as a result of the analysis, it has been concluded that there is a positive relationship between gold prices and the London gold market gold ounce price, and a negative relationship with the Dow Jones index.

In a study conducted by the World Gold Council in 2015 covering the period 1999-2014 for selected countries among developed and developing countries, what determines the reserve composition of central banks and the reasons for the tendency to gold in central banks' reserves were investigated. Accordingly, the composition of the reserves; It has been observed that the size of the GDP of the respective reserve money holder country is a function of the use rate of the relevant reserve money in global banking transactions and the economic policies of developed countries (factors such as interest rates and public debt).

Choudhry et al. (2015) aimed to investigate the relationship between gold return, stock return and stock market volatility during the financial crisis in the last decade for the United Kingdom, Japan and United States. In this study, there were created two models, one of them tests bivariate relationship between gold returns and stock market returns, and another tests bivariate relationship for gold returns and stock market volatility in FTSE100, S&P500 and NIKKEI 225. And lastly, both of these

relationships are investigated in multivariate nonlinear relationships including LIBOR rates. As a result, bivariate models show significant relationship for nonlinear feedback effect among variables during the financial crisis for all stock markets that are included in this study. In addition, multivariate models also show significant relationships between variables. Choudhry et al. concludes the study as gold did not playing “safe haven” property during the financial crisis because of the bidirectional interdependence; whereas, gold can be used as a hedge instrument during financial stability times.

Ghosh (2016), aimed to find determinant of gold demand in central banks’ reserves portfolio by using panel data methodologies. The dataset includes more than 100 countries and the time period was between 1988-2014. According to the results, while financial development and higher economic growth causes decrease in gold demand, higher exchange rate risk and monetary policy instability increases demand for gold by central banks. In addition to this, the recent financial crisis also causes a demand for gold by central banks’.

In the study of Gopalakrishnan and Mohapatra (2017), which includes 100 countries (49 developed countries and 51 developing countries in the high income group) for the period of 1990-2015 and using annual data, the effect of global risk perception on the tendency to hold gold in the reserves of central banks was examined. Using the dynamic panel estimation model, it has been observed that the tendency of central banks to gold is positively associated with global risk perception, and this relationship is higher in developed economies than in emerging economies. In addition, it was observed that as the ratio of capital account openness increased, the tendency to hold gold increased again, but as the ratio of countries’ reserves to their imports increased, this trend decreased. Considering the relationship of the trend with the exchange rate regime, it is seen that the trend is high in countries where the fixed exchange rate regime is applied. As independent variables, volatility index (VIX risk index - Chicago Board of Options Exchange), which is an indicator of global risk perception, capital account openness, ratio of trade volume to GDP, per capita GDP, GDP growth, inflation, 2010 fixed prices and gold prices, corporate investor risk index (credit rating), the ratio of loans to the private sector to GDP was used.

Qian et al. (2019), aimed to find determinants of global gold prices by trying various factors that affect gold prices. They used dollar index, the federal funds rate, CPI, exchange rate, oil prices and S&P 500 are the variables that are considered to

affect the global gold prices. For researching the effect of these variables, a reverse process of response surface methodology (RSM) is used to evaluate the impact of the variables on global gold prices. According to the results, except CPI all other variables have a negative impact on global gold prices. Moreover, CPI and Oil price on response variables is not significant at the 5% significance level, which also makes the interaction effect involving these two factors more complicated.

Chirwa and Odhiambo (2020), researches determinants of gold price in financial markets by taking into account multiple structural breakpoints. In their study, to investigate the determinants of gold prices they used time series analysis methods, ARDL-based error correction model and the data set of the study starts from December 2019 and ends in May 2020. In addition to this, the key variables are international stocks and bond funds that are used common in financial markets. As a result, gold prices based on the fourth breakpoint regime, has a significant and positive relationship with LSE, Nikkei stocks, T.Rowe global multi-sector bond and CBOE volatility index and negative relationship with emerging market debt and local currency in short and long run.

When gold prices and government debts are researched, it is expected to have a positive correlation. Although it has not faced researches that analyze the direct relationship between gold prices and government debt, it was considered that gold prices and government debt relationship can be researched by analyzing the impact of government debt to macroeconomic indicators.

When literature was analyzed, it was seen that researches are focused on the relationship between government debt and economic growth of countries.

Nguyen (2018) emphasizes that in the long run an increase in external debt leads to a decrease in GDP and a growth of unemployment and unemployment needs to be controlled for the impact that has on national expenditure.

Brkić (2016) analyzed Greece' experience and concluded that because of a high level of government debt and strong dependence on foreign borrowing a country will find itself in a severe debt crisis in a case of an economic downturn.

Zouhaier and Fatma (2014) have achieved the result that external debt negatively affects the economic growth of countries and there is a negative interaction between external debt and investment in the countries under consideration.

According to Spilioti (2015), government debt has an impact of lowering the level of Gross Domestic Product and thus economic growth. In the same vein, an

examination of the impacts of the economic decline in the Euro area between 2007 and 2011 is a testimony that "the gross government debt and deficit ratios have been increased rapidly causing a negative effect in the long-term fiscal sustainability" (Spilioti, 2015).

When the relationship between gold and economic growth, it is expected to observe that economic growth and gold have negative correlation due to usage of gold. As indicated in previous works, gold is used as a safe haven or hedge by households, central banks, investors and governments. The positive environment in economic conditions, tendency to invest in gold is expected to decrease. By the same view, larger debt of countries negatively impacts GDP growth and so by this, it is expected to increase the tendency to invest in gold. Therefore, it can be concluded as higher government debt causes an increase in gold prices.

To sum up, there is a lot of research on drivers of gold prices. On the other hand, the researches about gold prices and central banks' gold reserves are very rare in the literature. Moreover, it is not faced with research that analyzes the relationship between debt stocks of a country by international gold prices or by gold reserves of central banks. Therefore, the result of this research will have an academic contribution by handling the relationship between debt stock of countries and gold reserves of central banks'.

3. METHODOLOGY

In this part, it is aimed to give the research methodology of this study. Due to the nature of dataset and research questions, it is determined to benefit from econometric methods, especially panel causality methods. In this part, firstly the aim of this study will be to introduce. After, hypothesis and dataset will be presented and lastly econometric methodology and research model will be given.

3.1. Aim of The Research

From past to present, not only households tend to invest gold to protect their investment, but also the government also invests gold by increasing their gold reserves due to several internal and external reasons.. While this investment behavior is reasoned from gold's hedging or safe-haven property, it is expected to cause an increase in international gold prices.

In this research, it is aimed to study determinants of international gold prices by countries. First of all, the primary goal is to analyze whether there is a causal relationship between international gold prices and countries' gold reserves amounts. Furthermore, it is considered that the government uses gold to hedge for debt, price stability etc.... Therefore, the causality relationship between gold reserves of countries and government debt stock is also an important issue for this research. Lastly, it is aimed to highlight the causality relationship between governments' debt stock and international gold prices in this study.

According to these research goals, the following hypothesis is developed;

H1: There is statistically significant causality relationship between international gold prices and gold reserves of central banks

H2: There is statistically significant causality relationship between gold reserves of central banks and countries government debt stock

H3: There is statistically significant causality relationship between international gold prices and countries government debt stock

3.2. The Sample of The Study and Dataset

When the sample of the study is selected, it is considered that countries which are administratively and economically powerful have a meaningful impact on international gold prices. Therefore, the sample of the study is determined as G-8 countries. The group includes following countries;

- Canada
- France
- Germany
- Italy
- Japan
- Russia Federation
- United Kingdom
- United States

The dataset of the research consists of three variables. For 8 countries and 50 observations for each country, the dataset of the research includes 400 observations. Detailed information about variables are shown in Table 3.1.

Table 3.1 Information About Dataset

Variable			
Name	Definition of Variable	Frequency	Source
CGD	Central Government Debt Ratio to GDP of countries. The debt amount includes both internal and external debt from all instruments	Quarterly, from 2008Q1 to 2020Q2	World Bank
GoldReserves	Gold Reserve Ratio to Total Reserves of Central Banks.	Quarterly, from 2008Q1 to 2020Q2	World Gold Council
IntGoldPrices	International Gold Prices in USD	Quarterly, from 2008Q1 to 2020Q2	World Gold Council

3.3. Econometric Methodology

For testing the research questions, panel data methodologies will be applied in this study. Panel data analysis is a technique that combines time series and cross section series in the study, helping us analyze both time and section size together. Therefore, the number of observations in panel data models is quite high. The high number of observations is accepted as a positive factor in the feasibility of the analysis. In addition, the high number of observations increases the degree of freedom and decreases the possibility of a linear relationship between explanatory variables. Thus, panel data analysis gives more reliable results in conducting econometric estimates (Bölük, 2017).

There are some additional concepts in panel data, such as a balanced and unbalanced panel, to see the loss in observations. The balanced panel states that there is a whole number of observations of the variables in each unit and each time interval, while the unbound panel describes the lack of observations for at least one unit and at least one time (Stock and Watson, 2011).

Firstly, before applying panel causality model to the data, variables will be tested for stationarity, homogeneity and cross sectional dependence. After these tests are applied, the variable will be modelling with panel causality. The related methodology for each test was given in the sections below.

3.3.1. Panel Unit Root Tests

In panel data analysis, as in classical time series analysis, the first thing to be examined is the stationarity of the data. The stationarity of the panel data is directly related to the significance of the estimators. The stationarity of the panel data is examined by determining how the value of the previous period of the series affects the current period. Unit root tests are needed to determine this interaction (Sirvan and Alp, 2017).

In their study, Levin, Lin, and Chu (2002) evaluated that unit root hypotheses have a limited effect on the alternative hypothesis that shows a high rate of continuous deviation from the equilibrium level. They observed that this situation was more severe especially in applications with small samples, and they recommended a more effective unit root test for each cross section evaluated compared to the unit root tests currently applied (Baltagi, 2005).

Levin, Lin, and Chu (2002) assume that all units in the panel have first order partial autocorrelation. Three different models are foreseen for the time series measured in the article. These models are created without fixed parameters, with fixed parameters and with fixed parameters and trends as given in the equation below.

$$\text{First Model: } \Delta y_{it} = \rho y_{it-1} + u_{it}$$

$$\text{Second Model: } \Delta y_{it} = \alpha_{0i} + \rho y_{it-1} + u_{it}$$

$$\text{Third Model: } \Delta y_{it} = \alpha_{0i} + \alpha_{1i} + \rho y_{it-1} + u_{it}$$

In this test, u_{it} assumes that the tttt is modeled as follows:

$$u_{it} = \sum_{j=1}^{\infty} \theta_j u_{it-j} + \epsilon_{it}$$

While the panel unit root test process is in the first model, the null hypothesis is $H_0: \rho = 0$, the alternative hypothesis is $H_0: \rho < 0$.

The y_{it} series seen in model 2 have an individually-defined mean that does not include the time trend. Under this assumption, it covers a process where the null hypothesis is $H_0: \rho = 0$ and the alternative hypothesis $\alpha_{0i} = 0$ is $H_1: \rho < 0$ and $\alpha_{0i} \alpha_{0i} \in R$ for all i.

In Model 3, y_{it} series have a time trend and individually-defined mean. Finally, under the assumption, it examines a process where the null hypothesis is $H_0: \rho = 0$ and $\alpha_{1i} = 0$ for all i in the panel, and the alternative hypothesis is $H_1: \rho < 0$ and $\alpha_{1i} \in R$.

Another of the panel unit root tests is the Im, Pesaran and Shin (1997, 2003) test. This test allows for heterogeneity of the ρ value under the alternative hypothesis, unlike the Levin, Lin test. Although the model allows for individual effects, it does not have a time trend.

$$\Delta y_{i,t} = \alpha_i + \rho_i y_{i,t-1} + \sum_{z=1}^{p_i} \beta_{i,z} \Delta y_{i,t-1} + \varepsilon_{i,t}$$

3.3.2 Cross Sectional Dependence

Due to the increasing commercial and financial integration due to the globalization process, whether there is a possible dependency relationship between countries constitutes an important issue for panel data analysis. Because this situation may lead to the emergence of results that may affect the research findings and causal relations indirectly. Therefore, at the beginning of the analysis, cross section dependency should be tested first (Hatemi-J et al., 2015: 5).

To test the cross-sectional dependence, Breusch and Pagan (1980) first proposed the Lagrange Multiplier (LM) statistics based on the average of the correlation coefficients of the error terms (Pan et al. 2015: 2). This test can be applied in panels where the cross-section dimension (N) is constant and the time dimension (T) goes to infinity ($T \rightarrow \infty$), so the time dimension is greater than the cross-section dimension ($T > N$) (Baltagi, 2016: 4).

$$CD_{LM_1} = T \sum_{i=1}^{N-1} \sum_{j=i+1}^N \rho_{ij}^2$$

Here, ρ_{ij}^2 represents an exemplary estimate of binary correlations for error terms. Breusch and Pagan (1980) show the null hypothesis that there is no cross-sectional dependency as follows:

$$Cov(u_{it}, u_{jt}) = 0 \quad \text{for every } t, i \neq j$$

CD_{LM_1} test has a chi-square distribution asymptotically in the $N(N-1)/2$ degree of freedom; It is not valid for $N \rightarrow \infty$ (Pesaran, 2004: 4-5). For this reason, if N is large, the LM-BP test may cause the result to deviate from reality by causing size

distortions. Pesaran (2004) has developed the following test that can be applied in cases where both N and T are large in order to solve the problem:

$$CD_{LM_2} = \sqrt{\frac{1}{N(N-1)}} T \sum_{i=1}^{N-1} \sum_{j=i+1}^N (T\rho_{ij}^2 - 1)$$

The is CD_{LM_2} test estimated according to the $T \rightarrow \infty$ and $N \rightarrow \infty$ asymptotic normal distribution and analyzes under the null hypothesis (H_0) that there is no dependency between the horizontal sections (Erataş et al., 2019: 403). However, in the case of $N > T$, this test can show significant deterioration and the larger N, the higher the deviations. For this reason, Pesaran (2004) developed the CD_{LM_3} test to test the cross-sectional dependency if the cross-sectional dimension is larger than the time dimension (Koçbulut ve Altıntaş, 2016: 153).

$$CD_{LM_3} = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^N \rho_{ij} \right)$$

3.3.3 Test for Homogeneity

The second step in panel data analysis is to decide whether the slope coefficients are homogeneous (Chou, 2013: 229). Determining the homogeneity of the coefficients is important in determining the unit root and causality tests to be used (Erataş et al., 2013: 23). The first study of the homogeneity of slope coefficients was carried out by Swamy (1970). Swamy's test developed only for panels with $N < T$ is calculated as follows (Pesaran and Yamagata, 2005: 5):

$$\hat{S} = \sum_{i=1}^N (\beta_i - \beta_{wfe})' \frac{X_i' M_T X_i}{\sigma_i^2} (\beta_i - \beta_{wfe})$$

In the equation, β_{wfe} represents weighted pooled slope coefficients estimator, β_i represents least squares estimator and M_T represents the identity matrix (Topal, 2017: 193).

In order to determine whether the slope coefficients are homogeneous for each country, Pesaran and Yamataga (2008) developed the Swamy (1970) test as following;

$$y_{it} = \alpha_{it} + \beta_i x_{it} + \epsilon_{it} \quad \text{where } i = 1, \dots, N, t = 1, \dots, T$$

It is tested whether the coefficients in the cointegration equation in the above equation are the same among horizontal sections. The hypotheses of the test are as follows:

$$H_0 = \beta_i = \beta \quad (\text{slope coefficients are homogen})$$

$$H_1 = \beta_i \neq \beta \quad (\text{slope coefficients are homogen})$$

In addition to hypothesis tests, Pesaran and Yamagata developed delta tests for identifying which hypothesis is valid. The delta tests can be classified as large and small sample delta tests as follows (Pesaran, Yamagata, 2008):

$$\text{Large Sample: } \Delta = \sqrt{N} \left(\frac{N^{-1}S - k}{\sqrt{2k}} \right)$$

$$\text{Small Sample: } \Delta_{adj} = \sqrt{N} \left(\frac{N^{-1}S - E(z_{iT})}{\sqrt{VAR(z_{iT})}} \right)$$

In the equations above, N represents count of cross section, S represent Swamy test statistics, k represents count of confirmatory variables. Furthermore, $E(z_{iT})$ and $VAR(z_{iT})$ are represented below.

$$E(z_{iT}) = k$$

$$VAR(z_{iT}) = \left(\frac{2k(T - k - 1)}{T + 1} \right)$$

If the probability values of delta tests are greater than 0.05, H_0 hypothesis is accepted and it is decided that the slope coefficients are homogeneous.

3.3.4 Panel Causality Analysis

The fact that panel data sets contain much more data than time series brings along many advantages in terms of the application of causality tests. The first of these advantages is that the panel data sets contain a large number of data, allowing the use of more delay coefficients, thereby relieving the static assumption (Holtz-Eakin et al., 1988: 1373). In general, the use of panel data models in causality analysis eliminates possible problems that may arise in cases where a sufficiently long data set cannot be

obtained in causality analysis using time series, since it contains more data. (Al-Iriani, 2006: 3346).

In this study, to test causality between variables Dumitrescu –Hurlin Panel Causality test will be applied. The panel causality test developed by Dumitrescu -Hurlin (2012) is of great importance in eliminating the deficiencies of other panel causality tests in the literature. Dumitrescu -Hurlin panel causality test was developed to test causality in heterogeneous panel data models. The advantages of the test are that it takes into account the cross-sectional dependence between the cross-section units, it can be used in cases where the time dimension and the cross-section size are larger or smaller than each other, and it gives effective results in unbalanced panel data (Dumitrescu and Hurlin, 2012: 1451.)

Dumitrescu -Hurlin panel set out from the following linear model to test causality (Dumitrescu and Hurlin, 2012: 1451).

$$Y_{it} = \alpha_{it} + \sum_{k=1}^K \gamma_i^{(k)} Y_{i,j-k} + \sum_{k=1}^K \beta_i^{(k)} X_{i,j-k} + \epsilon_{i,t}$$

In the equation below; β_i shows slope parameters, α_i represents individual fixed effects, $\gamma_i^{(k)}$ represents lag parameters, and K represents the lag length that will be the same for all cross sections.

There are three basic assumptions in the Dumitrescu -Hurlin model.

1. Residuals of cross section units satisfies $E(\epsilon_{i,T}) = 0$ and $E(\epsilon_{i,T}^2) = \sigma_{\epsilon,i}^2$
2. $E(\epsilon_{i,j}, \epsilon_{j,s}) = 0 \forall i \neq j$
3. Variables that belongs to each cross section are cointegrated as $X_i = (X_{i,1}, X_{i,2}, \dots, X_{i,3}), Y_i = (Y_{i,1}, Y_{i,2}, \dots, Y_{i,3})$ and $E(X_{i,t}^2) < \infty, E(Y_{i,t}^2)$

Hypothesis of Dumitrescu -Hurlin tests are defined as follows:

$$\begin{aligned} H_0: \beta_i &= 0, & \forall i &= 1, \dots, N \\ H_1: \beta_i &= 0, & \forall i &= 1, \dots, N_l \\ \beta_i &\neq 0, & \forall i &= N_l + 1, N_l + 2, \dots, N \end{aligned}$$

The basic hypothesis states that there is no Granger causality relationship among the variables of all cross-section units, while the alternative hypothesis states that there is a Granger causality relationship between variables in at least one unit.

To test the hypotheses, Dumitrescu –Hurlin calculated individual Wald statistics for each of the cross section units. Then, they calculated the Wald test statistics of the panel by taking the average of these individual test statistics calculated. The test statistics for the panel are calculated as follows.

$$W_{N,T}^{Hnc} = \frac{1}{N} \sum_{i=1}^N W_{i,T}$$

In this equation, $W_{i,T}$ shows test statistics for cross sections is adapted to χ^2 distribution with k degrees of freedom. On the other hand, Dumitrescu –Hurlin stated that for small T values, the following standardized test statistics should be used, since the Wald test statistics of cross-section units cannot converge to the same chi-square distribution.

$$\hat{Z}_{N,T}^{Hnc} = \frac{\sqrt{N} [W_{N,T}^{Hnc} - \sum_{i=1}^N E(\hat{W}_{i,T})]}{\sqrt{\sum_{i=1}^N Var(\hat{W}_{i,T})}}$$

Dumitrescu -Hurlin stated that the $\hat{Z}_{N,T}^{Hnc}$ statistics gave good results in terms of size and power properties even in panels with a small number of cross-section units. Besides, a mistake made during the determination of the number of lags does not affect the results of the test (Dumitrescu ve Hurlin, 2012:1455).

4. FINDINGS

In this part, it is aimed to share the descriptive statistics of the dataset, preliminary tests results before causality test and causality test results.

4.1 Descriptive Statistics of Variables

In this part, it is aimed to describe the dataset with some critical statistics and share the visualization of the dataset to see some critical relationships clearly.

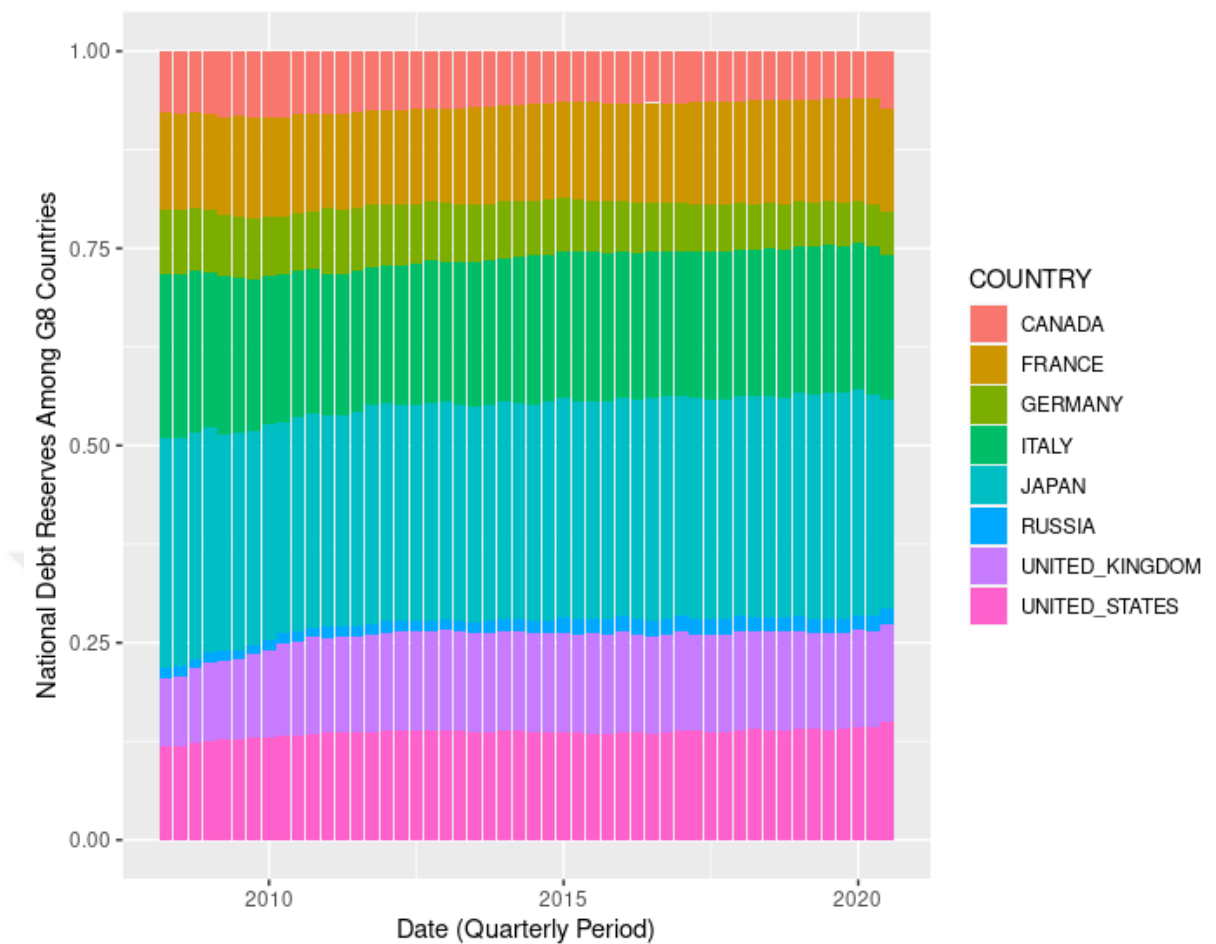
The descriptive statistics of data is shared in Table 1.

Table 1: Descriptive Statistics By Countries and Variables

	CGD (%)	GoldReserves	IntGoldPrices (\$)
Min	5,64	0,00	795,00
Max	212	0,79	1.722,00
Mean	82,6	0,37	1.291,00
Standard Deviation	51	0,32	236,00
Skewness	0,68	-0,01	0,06
Kurtosis	-0,06	-1,91	-0,51

In Table 1, variables' descriptive statistics are shown for groups of G8 countries. When G8 countries national debt reserves are evaluated, it can be seen that the minimum debt reserve was realized as 5,64 % while the maximum national debt reserve is 212 %. In addition to this, the mean of country debt was found as 82%. This shows that some countries prefer to borrow at a high level. Skewness and Kurtosis values of debt reserves shows that the country debt variable has a normal distribution. Moreover, the minimum value of gold reserves shows that some countries do not prefer to hold gold among their reserves or hold it at a very low level. Between 2008Q1 - 2020Q2 period average international gold prices was realized as \$1.291.

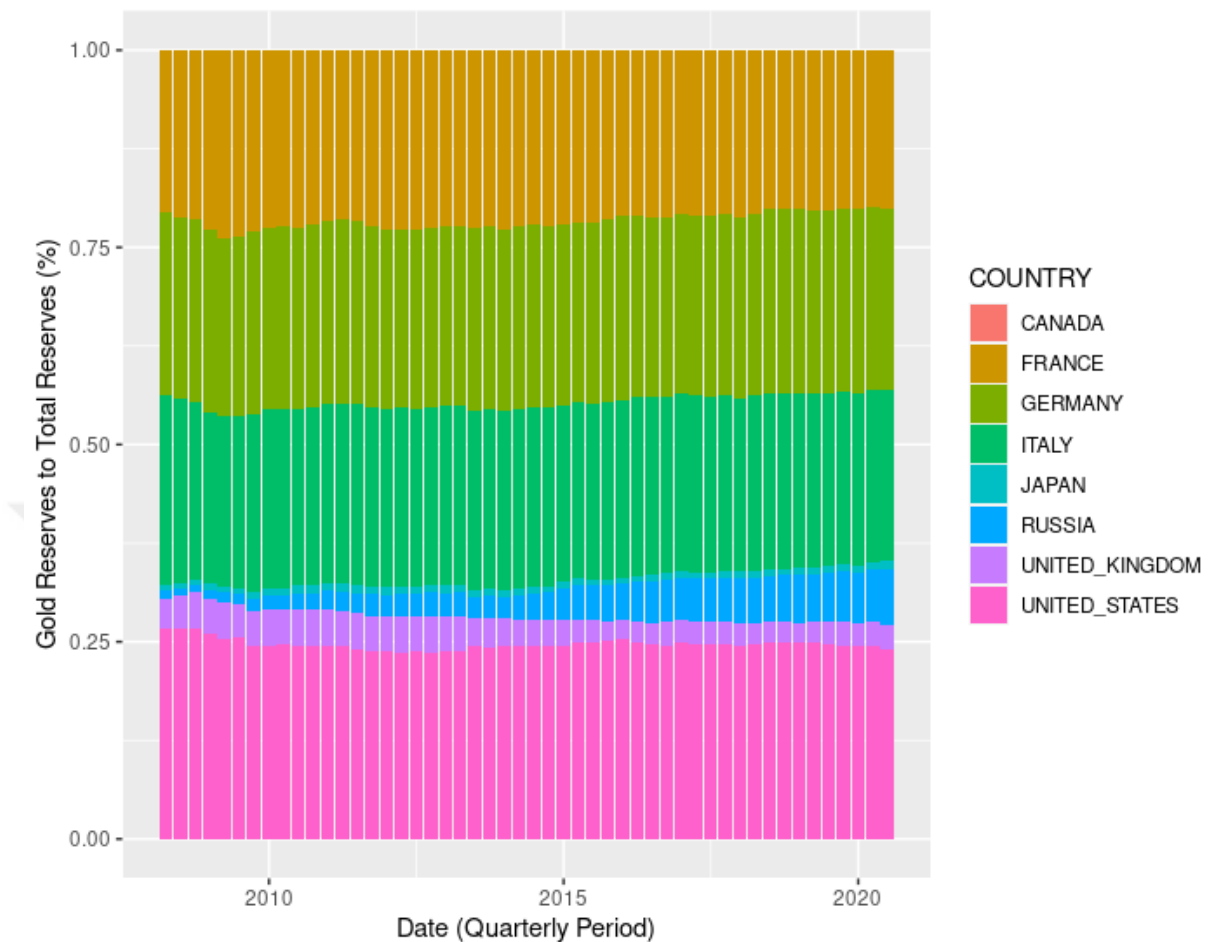
In addition to descriptive statistics, it will be more meaningful to analyze dataset by countries and time period. Firstly, CountryDebt variable is visualized by years and countries in Figure 1.

Figure 1: Countries Debt Reserves by Years

(Source: Author's calculation)

Figure 1 shows how much government debt stock owned by countries and how it has changed by years among G8 countries. First of all, Japan has the government debt stock among the G8 countries in all periods. Moreover, while the United States, United Kingdom and France's debt stock are approximately the same level, Germany and Canada's debt stock is lower than these three countries and they are in almost the same amount. Russia's debt stock is lowest among other G8 countries by years.

Countries gold reserves ratio to total reserves by years is figured out in Figure 2.

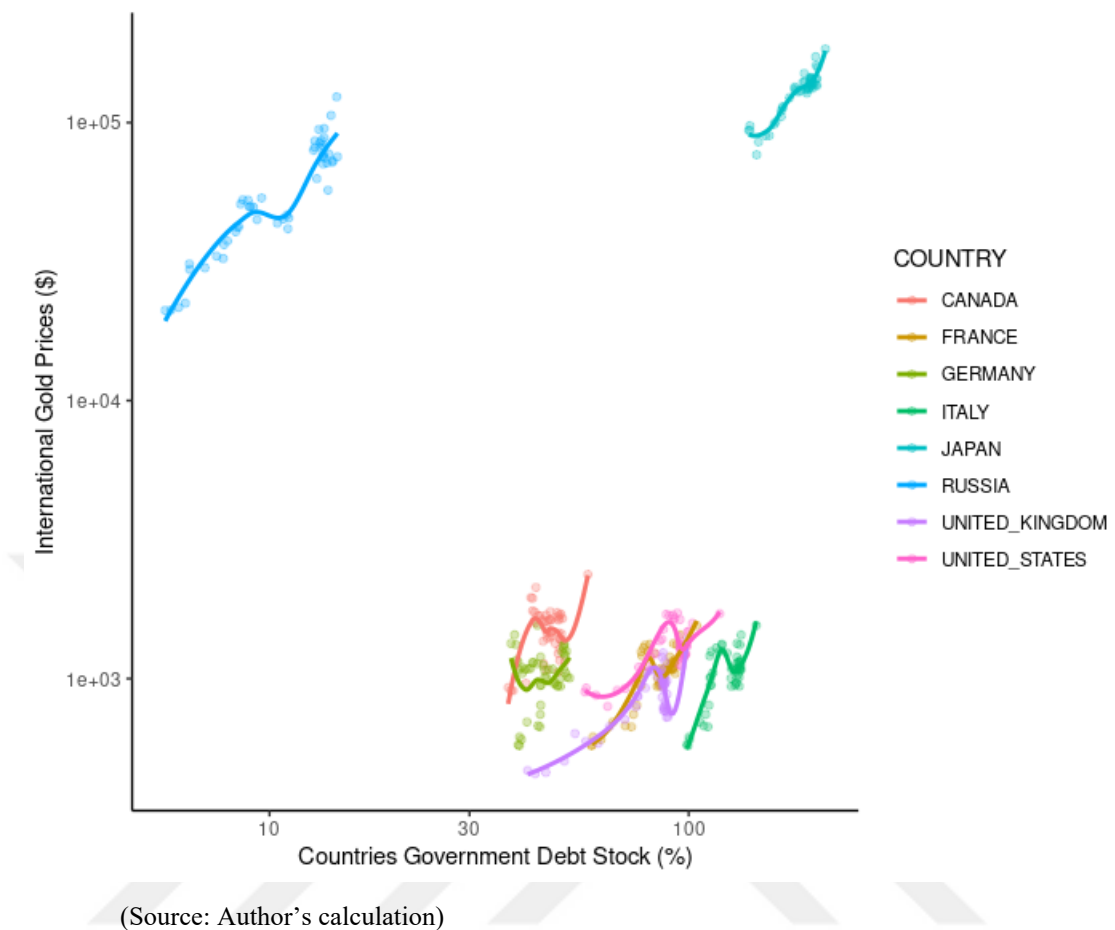
Figure 2: Countries Gold Reserve Ratio by Years

(Source: Author's calculation)

In Figure 2, it can be seen that for all periods, European Countries (France, Italy and Germany) and the United States have the biggest gold reserves among G8 countries. It is surprisingly seen that Canada almost does not hold gold reserves in total reserves. Furthermore, while Japan has the most government debt stock, it has the second lowest gold reserve ratio among G8 countries. After Japan, Russia is the third country that has the minimum gold in their reserve in G8 until 2013. After 2013, Russia increased gold reserves by period. Lastly, the United Kingdom's gold reserve decreased by time and by 2020 it has the second country that holds minimum gold in its reserves.

It is also important to analyze how variables are distributed together by the countries. Firstly, in Figure 3, it is shown the distribution of international gold prices by the countries' debt reserves.

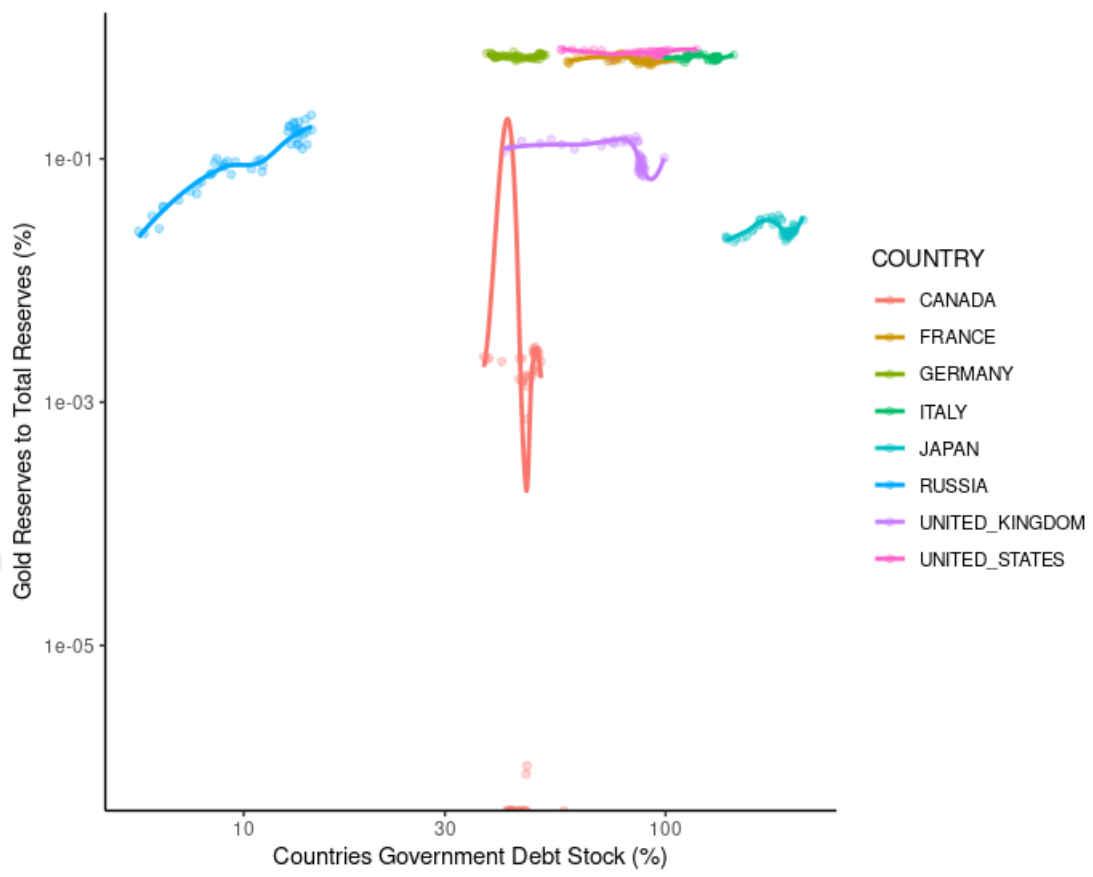
Figure 3: International Gold Prices by Countries Government Debt Stock



Firstly, it can be seen clearly that Russia's and Japan's government debt stocks and international gold prices have a positive correlation. The United Kingdom, Italy, France and Canada's figure is similar to each other and these figures show that Government Debt Stock and International Gold Prices can have a linear relationship. It is only not clear the relationship of national debt reserves and international gold prices for Germany.

Countries government debt stocks and Gold reserve relationships by countries are figured out in Figure 4.

Figure 4: Gold Reserves by Countries Government Debt Stock

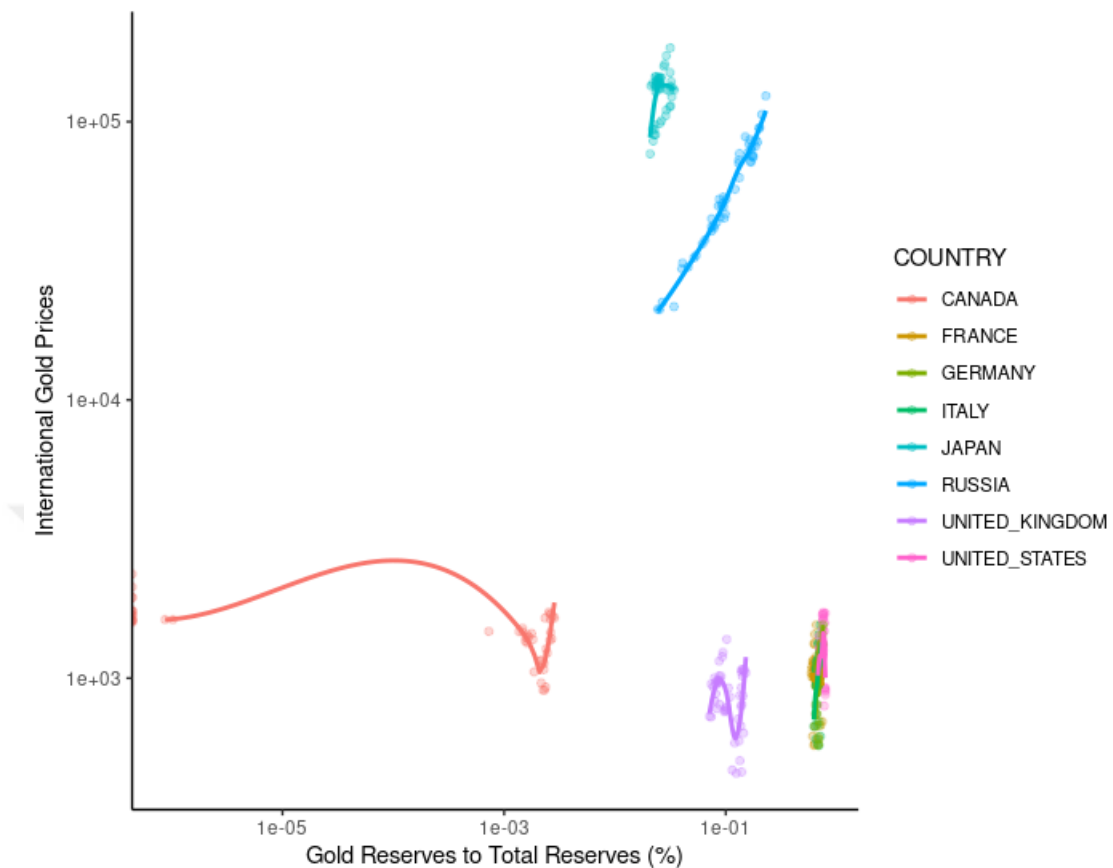


(Source: Author's calculation)

Similar to Figure 3, government debt stock and gold reserve ratio have a linear relationship for Russia and Japan. On the other hand, it seems as if there is no linear relationship for Canada. In addition to Canada, the United Kingdom's relationship is also seen as non linear. The other countries have almost a parallel line; therefore, the national debt reserve and gold reserve relationship is not clear for these countries.

Lastly, gold reserves and international gold prices relationship by countries is shown in Figure 5.

Figure 5: International Gold Prices by Gold Reserves



(Source: Author's calculation)

Like in Figure 3 and Figure 4, gold reserve and international gold prices have a linear relationship for Japan and Russia. Because of Canada's gold reserve situation, it can be said that there is no relationship occurred between variables in figure 5 for Canada. Also, it can be said that gold reserves and international gold prices have a non linear relationship for the United Kingdom. Because of the similarity of gold reserve level of other countries, it is not clear to see relationships between the variables. therefore, separated figures by countries are shared in Appendix (see Appendix 2).

4.2 Econometric Model Test Results

In this part of the study, to test hypotheses, panel granger causality test results are shared. Before the causality test, it is important to examine stationarity of variables. Because, if the variables have a unit root, it can misguide the causality results.

For testing the unit root of variables, Levin Lin Chun and IPS Panel Unit Root Tests are used. The tests results are shared in Table 2.

Table 2: Panel Unit Root Test Results

Levin Lin Chun Unit Root Test						IPS Unit Root Test			
		Intercept		Trend and Intercept		Intercept		Trend and Intercept	
		<i>P-</i>							
Order	Variables	Statistics	Value	Statistics	P-Value	Statistics	P-Value	Statistics	P-Value
I(0)	IntGoldPrices	2.227	0,987	1.918	0,972	2.331	0,99	0,92	0,82
	GoldReserves	23.039	0,591	-3.908	0,348	-0,90	0,18	-0,85	0,20
	CGD	-11.188	1,316	17.763	0,571	0,71	0,76	-1.093	0,14
I(1)	IntGoldPrices	-12.774***	0,000	-12.187***	0,000	-13.389***	0,000	-12.466***	0,000
	GoldReserves	-17.481***	0,000	-17.056***	0,000	-16.851***	0,000	-16.369***	0,000
	CGD	-10,968***	0,000	-10.274***	0,000	-5.533***	0,000	13.344***	0,000

*** indicates 1% significance level

According to Table 2, variables are not stationary in the level in terms of both unit root tests. Therefore, tests were applied to the variables for their first difference. When unit root tests are applied on the first difference of variables, test results are found as statistically significant at %99 confidence interval. Therefore, the variables are all stationarity in their first difference and in panel granger causality tests, variables are used in their first difference.

With today's globalization, countries can affect each other at different levels, as they are integrated into a global economic system. This interaction also has an impact on the results of econometric analysis. For this, cross-section dependency tests were tested for the countries in the panel. Test findings regarding cross section dependency are given in Table 3.

Table 3: Cross Section Dependency Test Results

Cross Sectional Dependencies (Pesaran, 2004)		
Variables	Z Statistics	P Value
IntGoldPrices	28.082***	0,000
GoldReserves	23.904***	0,000
CGD	17.553***	0,000

*** indicates 1% significance level

According to the results in Table 3, test statistics of all variables are found as statistically significant in %99 confidence interval (p-value < 0,01). Therefore, null hypothesis cannot be rejected and this means all variables have cross sectional dependence.

After cross sectional dependence, homogeneity of slopes of variables are examined by the Pesaran and Yamagata (2008) test. The test results are shared in Table 4.

Table 4: Homogeneity Test Results

Cross Sectional Dependencies (Pesaran, 2004)		
Variable	Δ	Δ_{adj}
IntGoldPrices	4.109*** (0,000)	4.378 (0,000)
GoldReserves	3.341*** (0,000)	3.518 *** (0,000)
CGD	2.8943 *** (0,002)	3.011 *** (0,001)

*** indicates 1% significance level

According to the results in Table 4, all test statistics are found as statistically significant in 99% confidence intervals. Therefore, it can be concluded as the slopes of variables are heterogen.

Lastly, Dumitrescu and Hurlin (2012) panel causality test was used to determine the existence and direction of the relationship between variables. While this test allows analysis with more observations, it can also produce effective estimates by considering

cross-section dependency and heterogeneity together (Alper and Oransay, 2015: 80). Test results are shared in Table 5.

Table 5: Panel Granger Causality Test Results

	Ztilde Test Statistics		
	K=1	K=2	K=3
<i>GoldReserves</i> granger causes to <i>IntGoldPrices</i>	-0,58394 (0,5593)	0,21454 (0,8301)	0,53643 (0,5929)
<i>IntGoldPrices</i> granger causes to <i>GoldReserves</i>	-0,15576 (0,8762)	-0,50039 (0,6168)	-0,34777 (0,728)
<i>GoldReserves</i> granger causes to <i>CGD</i>	0,40597 (0,6848)	-1,702 * (0,08)	-1,9967 ** (0,045)
<i>CGD</i> granger causes to <i>Gold Reserves</i>	0,18127 (0,8562)	1,267 (0,1982)	0,68019 (0,4964)
<i>IntGoldPrices</i> granger causes to <i>CGD</i>	1,175 (0,240)	-0,519 (0,6037)	0,62001 (0,5353)
<i>CGD</i> granger causes to <i>IntGoldPrices</i>	2,983 *** (0,002)	4,791 *** (0,000)	3,460 *** (0,000)

***, ** and * indicates 1%, 5%, and 10% significance level, respectively

The relationship between the variables was examined separately under the criterion that each unit had the same lag length, and both sides of causality were considered within the scope of moaning. First, when the variables of gold reserves and gold prices were examined, the test statistics between the two variables were found to be statistically insignificant for both directions ($p > 0.10$). Therefore, it is concluded that there is no bidirectional granger causality relationship between gold reserves and international gold prices for all lag lengths.

To test the second hypothesis, it is tested that there is no granger causality relationship between gold reserves and government debt stock of countries. According to the results in Table 4, a statistically significant bidirectional relationship between gold reserves and countries' government debt stock for $K = 1$ was not detected ($p >$

0.10). However, for $K = 2$ and $K = 3$, while the effect of gold reserves on the government debt stock of countries was found to be significant at 90% confidence interval, a statistically significant result could not be reached for the opposite. To summarize the test results for Hypothesis 2, while there is a significant relationship between gold reserves and countries' indebtedness in the group of G8 countries, this relationship has been determined as one-way affecting the government debt stock of the countries.

Finally, to test hypothesis 3, whether there is a significant relationship between the government debt stock of countries and international gold prices is tested bilaterally. The results in Table 4 show that international gold prices do not affect the government debt stock of countries at all lag levels, while the government debt stock of countries has a statistically significant effect on international gold prices at 99% confidence intervals at all lag lengths. Based on this, it can be said that the government debt stock of countries has an effect on international gold prices, but the opposite is not true. Therefore, although it is concluded that hypothesis 3 is supported, the test result can be summarized as the detected relationship is one-sided.

5. CONCLUSION AND DISCUSSION

As stated in many sources, there is no doubt to the significance of gold for not only its investment instrument but also its safe haven property for all agents in the economic system. At the financial economics level, gold's role is critical for protecting the economic system from instability and keeping balance of local currencies. Therefore, governments stock some of reserves as gold by central banks. In instabil environment of economics gold reserves that are held in the central banks tend to increase. European sovereign debt crisis is a good example for that reflex. While gold is used for hedging by the countries, it is important to research whether this behaviour is valid in the world's most developed economy. Besides, it is valuable to research the impact of developed countries' gold demand on international gold prices that is occurred due to the hedging of their economies. By taking into consideration that most developed

8 economies make more than 40% of global debt in total, it is considered that their gold reserves in central banks, their government debt reserves and international gold prices have causality relationships. In this study, it is aimed to identify empirical evidence of this relationship of this financial macroeconomic concepts.

The sample of countries was determined as Group of 8 (G8) countries. In addition to this, to investigate the relationship between variables that is mentioned in the research questions, government debt to GDP ratio is used for measuring debt stock of countries, international gold prices for gold prices and central banks' gold reserves to total reserves ratio for measuring gold reserves of countries are used for quarterly period between 2008-Q1 and 2020-Q2.

One reason why a causal relationship could not be established between gold reserves and international gold prices may be due to the fact that the gold reserves of the G8 countries did not change significantly. While it was observed that the gold reserves increased dynamically only on the Russian side in the panel, it was observed that there were minor changes in other countries, and Canada did not hold the Ltin reserve. When we consider the cross-sectional dependence in the data, it can be shown as a reason why the causality relationship cannot be established. However, it is recommended that researchers observe different country groupings while establishing a causal relationship between gold reserves and public debt in future studies and investigate the differences between G8 countries in order to reveal the causality relationship between these two financial macroeconomic variables more clearly.

Another result of the study is that gold reserves affect the government debt stock of countries. According to the results, it is observed that the gold reserves of the G8 countries affect the government debt stock of the next 1 and 2 quarters. When the debt stock of countries is considered as a risk factor, it is expected that such a causality relationship will be established between the gold reserves of central banks and the risk appetite of countries. This is because gold is used by macro and micro elements in the economy as a safe haven and / or hedging instrument. At the same time, this result coincides with the results obtained in the studies of Gosh (2016) and Gopalakrishnan and Mohapatra (2017).

Finally, a statistically significant result was reached in all significant lag lengths between a causal relationship between the government debt stock of countries and international gold prices. As mentioned in the second hypothesis of the study, countries increasing their gold reserves through central banks in order to hedge their risks cause

an increase in international gold demand and this affects international gold prices. However, the fact that there is no granger causality from gold prices to government debt stock gives us the sign that countries are buying according to their own risk profile, not by looking at the international prices of gold, especially for G8 countries. The causality analysis found from government debt stock to international gold prices also parallels with studies in the literature. Godsell and Tran (2011) explained in their study for the United States that the decline in the government debt stock also reduced the gold prices, as the low government debt stock strengthened the local currency and consequently reduced the demand for gold.



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APPENDIX

APPENDIX 1: COUNTRY SPECIFIC DESCRIPTIVE STATISTICS

1.1. Descriptive Statistics of Government Debt Stocks By Countries

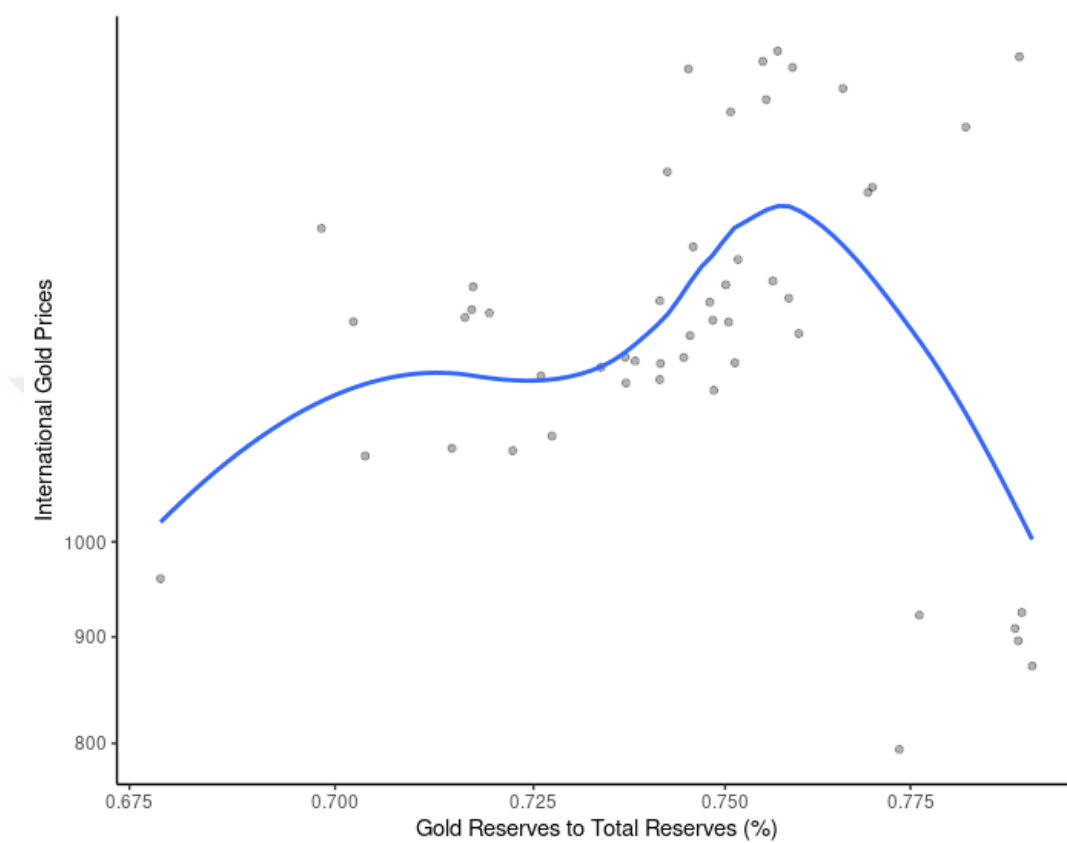
	Min	Max	Mean	Standart Deviation	Skewness	Kurtosis
Canada	37,1	57,5	46,3	3,66	-0,27	1,09
France	58,6	104	82,8	10,2	-0,71	0,09
Germany	37,7	52	44,8	4,37	0,04	-1,4
Italy	99	145	123	11,2	-0,59	-0,77
Japan	139	212	183	19,4	-0,96	-0,3
Russia	5,64	14,5	10,7	2,87	-0,26	-1,48
United Kingdom	41,3	99,2	79,9	13,6	-1,56	1,33
United States	56,6	119	90,2	12,6	-1,15	1,03

1.2. Descriptive Statistics of Gold Reserve Ratio of Central Banks By Countries

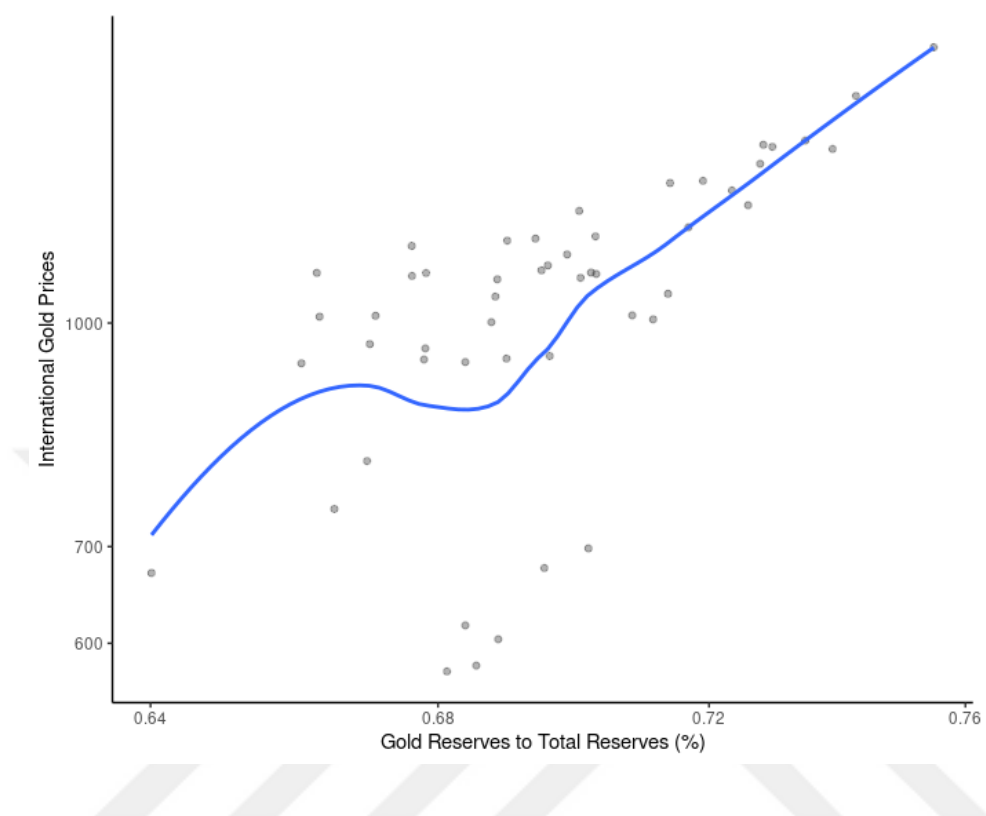
				Standart		
	Min	Max	Mean	Deviation	Skewness	Kurtosis
Canada	0	0,002	0,001	0,001	-0,22	-1,69
France	0,59	0,74	0,65	0,03	0,7	-0,192
Germany	0,64	0,75	0,69	0,02	0,23	-0,355
Italy	0,62	0,73	0,67	0,02	0,32	-0,586
Japan	0,02	0,03	0,02	0,003	0,65	-0,809
Russia	0,02	0,23	0,11	0,05	0,15	-1,22
United Kingdom	0,07	0,15	0,1	0,02	0,2	-1,6
United States	0,67	0,79	0,74	0,02	-0,23	-0,136

APPENDIX 2: COUNTRY SPECIFIC GRAPHS

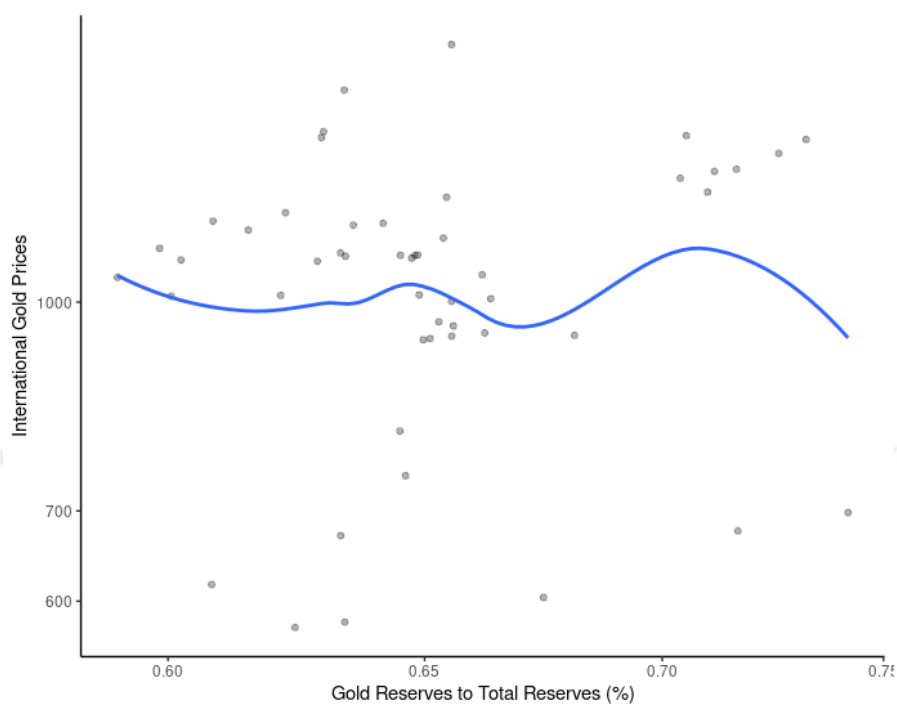
2.1. United States



2.2. Germany



2.3. France



2.4. Italy

