DOLLARIZATON IN THE BALANCE SHEETS OF METAL PRODUCTS AND MACHINERY FIRMS LISTED IN BIST DURING COVID-19 PANDEMIC IN TURKEY

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ABSTRACT

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Bak, Barış

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This thesis examines asset and liability dollarization of all firms in Borsa İstanbul Metal Products and Machinery Index (XMESY) in Turkey during Covid-19 Pandemic between 2018 and 2021. In order to illustrate the situation, the present study uses panel data estimation models with two dummy variables to check for time effects. The results suggest that exports share in total sales have a positive and statistically significant effects on liability dollarization. On the other hand, public offering year of firms and tangible asset ratio have negative and statistically significant influences on liability dollarization. Furthermore, leverage ratio and tangible asset ratio have statistically significant negative impact, number of employees has a positive and statistically significant effects on asset dollarization. There is not enough evidence to support any relationship between real exchange rate, consumer price index, cost of production and dollarization.

ÖZET

TÜRKİYE'DE COVİD-19 PANDEMİSİ SIRASINDA BIST METAL ÜRÜNLER VE MAKİNE FİRMALARININ BİLANÇOLARINDA DOLARİZASYON

Bak, Barış

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Ocak, 2022

Bu tez, Covid-19 Pandemisi sırasında 2018-2021 yılları arasındaki zamana denk gelen süre zarfında Türkiye'deki Borsa İstanbul Metal Eşya ve Makina Endeksi'nde (XMESY) yer alan tüm firmaların varlık ve yükümlülük dolarizasyonunu incelemektedir. Durumu göstermek için panel veri teknikleri ve zaman etkisini kontrol etmek adına iki kukla değişken kullanılmıştır. Panel veri teknikleri sonucunda ihracatın toplam satışlardaki payı ile yükümlülük dolarizasyonu arasında istatistiksel olarak anlamlı ve pozitif bir ilişki saptanmıştır. Öte yandan, firmaların halka arz yılı ve maddi duran varlık oranları ile yükümlülük dolarizasyonu arasında negatif ve istatistiksel olarak anlamlı etki bulunmaktadır. Ayrıca kaldıraç oranı, ve maddi duran varlık oranı, varlık dolarizasyonu üzerinde istatistiksel olarak anlamlı olumsuz bir etkiye sahipken, çalışan sayısı varlık dolarizasyonu üzerinde pozitif ve istatistiksel olarak anlamlı bir etkiye sahiptir. Reel döviz kuru, tüketici fiyat endeksi, üretilen malın maliyeti ve dolarizasyon arasında herhangi bir ilişkiyi destekleyecek yeterli kanıt bulunmamaktadır.

Anahtar Kelimeler: Varlık Dolarizasyonu, Yükümlülük Dolarizasyonu, Covid-19 Türkiye

To My Family, …

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LIST OF ABBREVIATIONS

ADF: Augmented Dickey-Fuller Test

AIC: Akaike Information Criterion

ARDL: Autoregressive Distributed Lag Bound Test

ASDO: Asset Dollarization

BIST: Borsa İstanbul

BP: Breusch-Pagan Test

CBRT: Central Bank of Republic of Turkey

GLS: Generalized Least Squares

KAP: Public Disclosure Platform

LM: Lagrange Multiplier

OLS: Ordinary Least Squares

TUIK: Turkish Statistical Institute

VAR: Vector Autoregressive Model

VIF: Variance Inflation Factor

XMESY: BIST Metal Products, Machinery Index

CHAPTER 1: INTRODUCTION

Dollarization is a phenomenon that occurred when firms and households in a country choose to use foreign currency or foreign assets as unit of account and a store of value over domestic currency or domestic financial assets (Calvo and Vegh, 1992). Since the beginning of the 90s, this phenomenon can be observed in emerging markets with high inflation rates. Although dollarization evokes the meaning of using the United State Dollar as unit of account and a store of value, in this study, dollarization is a generalization for the purpose of indicating the usage of any foreign currency other than national currency.

Towards the end of 2019, the Covid-19 epidemic disease, which started in Wuhan, the largest city of China's Hubei province, spread around the world in a short time and started to threaten human life and national economies. On March 11, the World Health Organization recognized Covid-19 as a pandemic (WHO, 2020). Covid-19 played a triggering role in the emergence of economic crises. In times of crisis, some sectors come to the fore. The health and food sectors have becoming main example of this case in the Covid-19 Pandemic. Similar to the health and food industry, it is possible to observe an increase in gains of cargo companies and factories that continue production without interruption (Gümüş and Hacıevliagil, 2020). Since the emergence of the pandemic, scholars have been explored the effects of Covid-19 on sectors such as Textile-Leather, Sports, Tourism and Transportation (Göker, Eren and Karaca, 2020). Although there are studies that focus on many other sectors in Borsa Istanbul (BIST), there is one sector that has not yet been examined in detail, i.e., Metal Products and Machinery Sector (XMESY).

This study focuses on the Metal Products and Machinery Sector of Borsa Istanbul specifically. Hence, the aim of this thesis is to illustrate asset and liability dollarization in the balance sheets of firms that are member of BIST Metal Products and Machinery Index (XMESY) in Turkey during Covid-19 Pandemic, which is an era defining event. All companies included in this index were examined comprehensively and inclusively. In literature it is possible to come across with studies related to other sectors however there are not many studies conducted in BIST Metal Products and Machinery Index which is a promising, growing and developing sector.

Expected outcomes and original contribution to the literature can be listed as follows: First, this thesis shows the relationship between dollarization and Covid-19, and it has furthered the discussion about dollarization of previous studies in the literature. Second, present study displays the relationship between Metal Products and Machinery Sector and dollarization on Covid-19 Pandemic era by exploring all financial reports and statements between 2018 and 2021 of companies included in XMESY Index. It is therefore not only timely and relevant, but also constitutes one of the most comprehensive studies in its area of investigation. Third, it carries an analysis based on XMESY, which is albeit important an underexplored sector. Although it is possible to come across with studies related to other sectors in the literature, there are not many studies conducted in BIST XMESY Index. Therefore, this study also fills a lacuna in the literature by focusing on this promising, growing and developing sector.

The study consists of five chapters which starts with an introduction in the first chapter. The following chapter contains literature review in which information about dollarization, and brief history of Turkish industrial background as well as dollarization in Turkey are examined. The third chapter is devoted to population and methodology of the study. The fourth chapter contains, two panel data estimation models, one for asset dollarization one for liability dollarization, with various variables (number of employees, leverage ratio, share of exports, tangible asset ratio, year of establishment and public offering, short term foreign debt ratio, real exchange rate, consumer price index, cost of production and two dummy variables) in order to show the dollarization of XMESY firms during Covid-19 Pandemic. Over 14 time periods (2018 – 2021), 480 observations were for each variable. The study ends with a conclusion in the fifth chapter.

CHAPTER 2: LITERATURE REVIEW

2.1. Definition of Dollarization

In order to fully comprehend dollarization, it is substantial to realize the difference between currency substitution, which is dollarization and asset substitution. Even if currency substitution and asset substitution are two concepts used in the same sense, dollarization use foreign currency or foreign assets as unit of account and a store of value, on the other hand currency substitution is the realization of the entire function of local money by foreign currency (Calvo and Gramont, 1992). Both currency substitution and asset substitution utilize foreign currency or foreign assets. Asset substitution mostly preferred by companies which favor non-optimal investments and less risky assets. Main reason behind this, executives believe low-risk assets will attract investors by creating an environment of trust. Although, it can be said that asset substitution is a type of dollarization due to its usage of foreign currency or foreign assets as a store of value (Feige, 2003). It is often a risk/return consideration, it harbors purpose of profiting. On the other hand, dollarization is result of high inflation, currency instability and economic crisis which makes dollarization a coping mechanism of households, firms and even states. Asset substitution can be a step towards currency substitution.

Depending on the usage level of foreign currency, dollarization can be divided into two main types. First and the most common type of dollarization is unofficial/partial dollarization which is also called de jure dollarization. In partial dollarization, local currency is legal tender. Companies and households convert part of their assets and liabilities to foreign currencies or foreign assets in order to avoid currency depreciation due to high inflation (Serdengeçti, 2005). In other words, individuals and firms choose to use foreign currencies as a store of value. Since both partial dollarization and asset substitution use foreign currency as a store of value, it is easy to mix them up. Main purpose of partial dollarization for individuals is to protect their purchasing power and overcome negative effects of high inflation (Quispe-Agnoli, 2002). National currencies in high-inflation countries are more fragile against shocks than low inflation countries' currency. That is the main reason why individuals tend to trust foreign currency more than their national counterpart.

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Hence individuals and firms see dollarization as a solid alternative to hedge themselves from the uncertainty of the economic environment. Individuals want to both protect the economic value of their savings and take advantage of the opportunities created by the volatility in macro variables by choosing foreign currency or assets.

When a country officially adopts a foreign currency, as unit of account and a mean of payment, rather than using its national currency, it is called full or official dollarization (Reinhart, Rogoff and Savastano, 2014). Official dollarization is also called de facto dollarization. In official dollarization, adopted foreign currency has full tender status. The main difference between de jure and de facto dollarization is based on which institution the dollarization is based on. Basically, if government forces dollarization, it is full/official/de facto dollarization, if firms and individuals prefer to use foreign currency or assets is it partial/unofficial/de jure dollarization. Partial dollarization is a step of full dollarization. A country cannot adopt a foreign currency as a legal tender without partial dollarization. Full dollarization can be divided into two; one-sided full dollarization (unilateral) and two-sided full dollarization (bilateral). One sided full dollarization happens when a country adopts foreign currency as their legal tender without mutual agreement or any treaty with the country whose currency is adopted. In unilateral dollarization, central bank needs to find the necessary reserves to buy foreign currency by its own. On the other hand, two-sided full dollarization occurs when a country adopts foreign currency as their legal tender through a bilateral agreement. (Hausmann and Powell, 1994)

Heretofore, partial and full dollarization can be considered within the macroeconomic point of view. Since this study contains dollarization of firms, it is also crucial to understand following concepts in order to fully grasp the microeconomic side of dollarization. From microeconomic perspective, it is possible to observe that dollarization is reflected in the balance sheets of economic units in three ways: liability dollarization, asset dollarization and financial dollarization (Taşseven and Çınar, 2015). The first of these is asset dollarization, which includes foreign currency and foreign currency denominated assets in the assets of the balance sheets of economic agents, (Yılmaz and Uysal, 2019) and the second is the liability dollarization. Liability dollarization is the situation where banks and companies have liabilities as foreign currency (İlker, 2007). Financial dollarization is a combination of both asset dollarization and liability dollarization. In other words, financial

dollarization refers to the fact that economic units generally show both assets and liabilities in foreign currency on their balance sheets (Karakaya and Karoğlu, 2020).

2.2. Benefits and Costs of Dollarization

Primarily, it is possible to say fixed exchange rate regime have many benefits but two benefits stand out. First benefit of fixed regime is, countries subject to fixed regime have to bear less transaction cost related to their interactions. Secondly, fixed exchange rate disables government's freedom to change exchange rate because fixed exchange rate acts like a nominal anchor. Fixed exchange regimes cause governments to loss monetary independence (Stein et al., 1999). Dollarization has downsides and upsides similar to fixed exchange regime, however features of dollarization amplifies both costs and benefits of it. This amplification effect caused by dollarization character which emerged by adopting more trustworthy currency issued from a reliable monetary authority (Curutchet, 2001). Main attraction of dollarization is the stability and integration that dollarization provided for the developing country. It is believed that, dollarization increases the predictability as well as reliability of monetary policy. In addition to that, dollarization prevents the worsening of crises by eliminating the risk of devaluation and contributes to stability by lowering interest rates (Calvo, 1999). Schuler (1999) supports that dollarization is a strong tool for monetary system because dollarization makes international monetary system more resilient and less vulnerable to crises. He also added that it would be best interest of countries with emerging market to consider adopting foreign currency. Munhupedzi, and Chidakwa (2017) supported dollarization by stating that the benefits provided by dollarization outweigh the costs, that all the benefits of dollarization will emerge when conditions such as adequate liquidity are met, investments and business environment in the country will be positively affected. The stability to be achieved in the economy as a result of dollarization reduces the risk of returning the loans entering the country, increasing confidence, and this increases the possibility of longer-term and lower-cost loans to enter the country. Dollarization can reduce the country's foreign credit costs and encourages the development of international trade. In addition to that, dollarization eliminates the exchange rate risk and makes long-term borrowing possible; thus, enabling companies to finance their long-term investment projects (Özen, 2018).

Even though individuals choose foreign currency to avoid high inflation and economic crisis, partial and full dollarization does not really reduce the impact of these phenomena. Furthermore, it could be an obstacle to monetary policy conducted by the government (Alvarez-Plata and Garcia-Herrero, 2007). In the fullest of time government policies disrupted by dollarization unable to meet their goals can cause increase in cost of living and decrease in purchasing power. On the full dollarized case central bank cannot control the money supply. This prevention undermines the independence of monetary policies (Berke, 2009). In other words, full dollarization limits central banks' ability to use monetary policy instruments, such as the interest and exchange rates which is also amplifies the belief of dollarization increase cost of living and decrease purchasing power in the long run. Exchange rate can be used to control money demand and interest rates. However, central bank of in fully dollarized country, neither have a control over exchange rate nor central bank can use exchange rate as a buffer in economic shocks. Another key factor to take consideration is when a country embraces full dollarization is that government forego its seigniorage rights. Seigniorage is revenue that governments make by producing money. Profit comes from the difference between face value of the currency and cost that producer bear. Since state adopted a foreign currency which they have no control, it has no right to print any money. When central bank cannot print money, it obstructs the function of central bank as a lender of last resort. In full dollarization, it is more severe as a result central bank cannot bail out the financial system (Broda and Yeyati, 2002). In the light of these factors, it is safe to say that countries give up their economic freedom while adopting a foreign currency. Highly dollarized agents might face extreme financial burden in depreciation times. In case of this happens two effects comes into mind; first, liquidity effect and second effect; it might cause net worth reduction due to currency mismatch (Galindo et al. 2007).

Should developing countries with high inflation rates and unstable economies dollarize? Unfortunately, there is no easy answer for this question. It is known that dollarization has disadvantages as well as benefits for the country's economy. Most of the firms and households in countries with emerging markets already has partial dollarization to maintain their economic well-being (Berg and Borensztein, 2000). On the other hand, full dollarization is not as easy as partial dollarization. Certain criteria must be met in order for full dollarization to take place. Towards the end of the 20th century, Argentina was having a hard time with its monetary and exchange

rate policies. Similarly in early 2000, Ecuador was in a harsh political and economic crisis. Both countries find their relief in adopting United State Dollar as a legal tender. Some underdeveloped Latin American countries like El Salvador (in 2001) followed their footsteps and abandoned their national currencies to adopt foreign currency hoping to solve economic instability and macroeconomic crisis. Thus, become fully dollarized countries. Considering there are significant economic instabilities and high degree of unofficial dollarization in Turkey, some economists may arise discussions about the transition to official dollarization from time to time. However, considering disadvantages of dollarization such a process does not seem possible for Tukey in close future (Özen, 2018).

2.3. *How to Measure Dollarization*

Although there is no clear and generally accepted definition for measuring dollarization in a country, dollarization measurement is highly relevant to the content of the study and what is wanted to be done. This study aims to interpret asset and liability dollarization of firms. Measurement of these dependent variables as follows; Asset Dollarization of Firms = Total Foreign Assets / Total Assets, Liability Dollarization of Firms = Total Foreign Liabilities / Total Liabilities ((Kesriyeli, Özmen and Yiğit, 2005; Yılmaz and Uysal, 2019).

2.4. *Economic Background of Turkey*

Since this study be directly associated with dollarization of Metal Products and Machinery sectors in Turkey, it is helpful to have knowledge about the stages of economic background of Turkish industrialization. Towards the end of the Ottoman Empire era, Ottoman Empire had heavy foreign debts due to false political policies of Ottoman rulers and dishonest or fraudulent conduct by government agencies. In addition to that, the Ottoman economy was an economy that was carried out by extremely backward methods, generally based on human and animal power of agricultural production. The economic structure of the Empire almost came to the point of collapse with the effect of the Balkan Wars, First World War and Turkish Independence War (Koçtürk and Gölalan, 2010). After collapse of Ottoman Empire newly founded Republic of Turkey needed to spent its remaining resources to

resurrect an economy that was crumped, lacked national capital and enterprise power. Between 1923 and 1933 the first important steps were taken to place the modern nation-state model, with all its institutions and rules, in all areas of the economy (Tecer, 2006).

2.4.1. Liberal National Economy Period (1923-1933) and State-Led Development Period (1933-1950) of Turkey

In the first years of the Turkish Republic, it was a fact that there was no industry in any field in Turkey. The need for industrialization in every field in the new Turkish State was an indisputable reality. In order to satisfy that need at the Izmir Economy Congress held on February 17, 1923, founding fathers of Turkish Republic stated that Turkey needs to surpass the classical agricultural culture and economy for rapid change and development towards the level of industrialized western countries. Turkey embarked on era-changing revolutions and economic reforms. In line with the decisions taken in Izmir Economy Congress, the Law for the Encouragement of Industry was enacted on 28 May 1926 in order to ensure the development of the national industry. In addition to that, credit facilities were provided to the industrialists and an Encouragement Law (Industry Encouragement Law) was enacted in 1926 so that private individuals could work and develop industrial establishments comfortably. In order to protect the domestic industry, laws like the Customs Tariff Law were re-arranged. But despite all the efforts, the private entrepreneur who did not have the necessary capital and the staff could not succeed to establish solid industrial establishments. Thereupon, the Turkish state felt the need to take over the industrialization business its own hands (Burak, 2008).

2.4.1.1. The Great Depression (1929) and Turkey

Turkey, which has an agriculture-based economy, has been hit hard by the decrease in agricultural product prices caused by The Great Depression of 1929. During crisis time Turkey experienced a deflationary process in its economy, shrinkage in the economy and significant decreases in foreign trade volume (Işık and Duman, 2021). The crisis has caused some regulations and measures in Turkey. One of them is the establishment of The Central Bank of the Republic of Turkey (CBRT).

With the establishment of the Central Bank, the Turkish State gained a policy tool that would help to create monetary and foreign exchange policies, and the development of national ministry gained momentum. The foreign trade deficit, which was seen as the main reason for the depreciation of the Turkish currency due to the effect of the Global Economic Crisis, forced the Turkish Government to work to limit the consumption of imported goods. Having focused on agriculture before the 1929 Crisis, Turkey understood the necessity of state interventions and virtualization in the economy after this crisis. It was the beginning of the road to statism and industrialization (Bulut, 2003).

2.4.1.2. First Five-Year Industrialization Plan (1933 - 1938) and Second Five-Year Industrialization Plan (1938 – 1942

After the Izmir Economy Congress, some support was given to the private enterprise for establishing industrial facilities. However, the desired results from these attempts could not be achieved. Thereupon, the principle of statism was accepted in 1931 and it was foreseen that the industrial facilities needed by the country would be established by the state itself (Polatlıoğlu, 2017). In First Five-Year Industrialization Plan (1933 - 1938) and Second Five-Year Industrialization Plan (1938 – 1942) plans been the result of the choice of a development strategy that focuses on industrialization. In this strategy, the development of the industrial sector has been accepted as a driving role for other segments. After 1933, industrialization has been the most important factor in Turkey's long-term development (Özyurt, 1981).

2.4.2. Liberal Economics Trial Period (1950-1960)

2.4.2.1. Urgent Industrial Plan and Vaner Economic Development Plan

Although, 1946 Urgent Industrial Plan and 1947 Vaner Economic Development Plan are closely dated, these two planning approaches are very contradictory to each other on fundamental issues of planning, such as the economic rationale in their preparation, stages of preparation, financing methods, and even the key sector chosen for development. The 1946 Urgent Industrial Plan was similar to

its predecessor First Five-Year Industrialization Plan and Second Five-Year Industrialization Plan, based on reinforcing industrialization of Turkey, and adopted an understanding that was prepared for the economic move to be made immediately after the Second Word War, largely based on internal resources, industry priority and basically *"self-sufficiency"* reflecting self-confidence. On the other hand, 1947 Vaner Economic Development Plan was a plan based on foreign resources, aiming at development under the light of agricultural advancement, and unlike other plans that comes before this plan, the Vaner Plan is a plan model in which exports are encouraged and industrialization is completely neglected (Ay, 2012).

2.4.2.2. *Opening to Free Market and Foreign Capital*

Until 1950, Turkey had a closed and protectionist, inward-looking economic policies. After the Democratic Party came to power in 1950, the old economic policies were abandoned and a free foreign trade regime was adopted. Moreover, a development approach towards foreign markets came. It was aimed to shift the industry, which has been in the hands of the State until now, towards the private sector. Similar previous indoctrination plans, protectionist policies that prioritize industrialization and import substitution were preferred instead of an industrialization policy based on agriculture and foreign trade. However, with the increase in imports making external deficits, the economic structure has become able to stand on the basis of foreign aid, credit and foreign capital investments. After this period, Turkey has started to move forward in an import substitution industrialization process that emphasizes the production of consumer goods for the domestic market (Kanca, 2013).

2.4.2.3. *Economic Withdrawal, 1958 Foreign Exchange Crisis*

Between 1956 - 1958 foreign trade of Turkey decreased and short-term loans were insufficient. External debt began to increase, and inflation began to climb around 20% with the growth of public deficits. When the capital flow abroad due to the expectations of the depreciation of the Turkish Lira was added, the Turkish Lira experienced a serious devaluation. Prices continued to rise and eventually, stagflation

took place. As a result, Turkish economy entered a serious contraction. (Kazgan, 2002). This foreign exchange crisis continued until the military coup of 1960.

2.4.3. *Planned Economy Period (1960-1980)*

2.4.3.1. *First Five-Year Development Plan (1963 - 1967) and Second Five-Year Development Plan (1968 - 1972)*

The heavy industry facilities to be established in this period helped modernize the agricultural sector and transfer resources from agriculture to industry. In addition to that, those facilities that are established in this period create an environment conducive to the development of small industries (İlkin, 1988).

2.4.3.2. *Third Five-Year Development Plan (1973 - 1977) and Fourth Five-Year Development Plan (1978 - 1982)*

By the year 1977, Turkey faced with a situation similar to the foreign exchange crisis experienced in 1958. Turkey, as in the previous 1958 crisis, sought to find foreign credit and implement new devaluation and hike policies for a solution in the 1977 crisis. Since the basic economic policies and industrialization strategy were not changed, the economy could not escape from entering new depression periods after a short time (Uludağ and Arıcan, 2003).

2.5. *Dollarization, Inflation and Turkey - The Period of Integration with the Global Economy (Post 1980)*

In the pre-1980 period, high inflation in Turkey was chronic. In addition to that, the external deficit has also become permanent as a result of the economic policies implemented. In order to solve the aforementioned problems in the economic environment, it was necessary to create a program that includes various reforms. In order to tackle these obstacles mentioned above, a number of decisions were taken on January 24, 1980 the daily exchange rate application was started by The Central Bank of the Republic of Turkey (CBRT) in 1981 and in 1988, an application was made to determine the exchange rates in the market (Balaylar, 2018).

The Turkish Lira became convertible within other foreign currencies with the Decree No. 32 issued on August 1, 1989. In addition, domestic and foreign individuals and institutions were provided with the opportunity to open deposit accounts in Turkish Lira and foreign currency, and to invest in financial instruments such as borrowing and stocks (Kal, 2019). Thus, it has become an environment suitable for dollarization for households and companies in the Turkish economy.

One of the first studies about dollarization and inflation in Turkey conducted by Ertürk (1991). He used Leased Square Method to determine a linear relationship between increase in inflation and increase devaluation expectations. This relationship also creates an increase in foreign currency interest rates which will eventually causes an increase in foreign currency demand. He used money supply, national and foreign interest rates, Dollar and Mark exchange rates to explain why foreign currency demand will increase in high inflation environment. Later, Yamak and Yamak (1997) expanded literature by adding government credibility to previous variables and find out there is a statistically significant and positive relationship between expected changes in exchange rates and dollarization. With the help of leased square method, Küçükkale (1996) shows there is a significant relationship between foreign currency demand and inflation expectation and supported the belief that there is a positive relationship between dollarization and inflation. Aklan (2001) determined causality from inflation to dollarization by using Granger Causality Test.

Despite the relatively falling inflation and increasing macroeconomic stability after the 2001 crisis, corporate sector firms appear to rely heavily on foreign currency and short-term debt instruments. Short-term borrowing continues to pose risks for companies on the basis of both interest rate shocks and global liquidity shocks through currency and maturity mismatches. Short term debts might enhance decline in the net worth of a company if interest rates increase and cause to a rollover risk. (Bernanke, Gertler and Gilchrist, 1999). Darıcı (2004) used real exchange rate, inflation, interest rate on deposits to explain real exchange rate and inflation trigger currency substitution. Us and Kıvılcım (2005) utilized Autoregressive Distributed Lag Bound Test (ARDL) and inflation, the difference in foreign and national interest rates, the real exchange rate, the credibility of the government variables to explain the inflation rate is the most important variable that determines currency substitution. Hekim (2008) found out the same result with the same variables by using Leased Squares Merhod. Saraç (2010) used vector autoregressive model (VAR) and with

help of Consumer Price Index and Producer Price Index of Turkey between 1994 and 2009, Saraç also pointed out inflation is the cause of dollarization.

Kıymaz (2003) believed "*Turkish firms are highly exposed to foreign exchange risks*." He also claimed that this exposure less evident in industries like food, beverages, service and non-metal industries. In addition to that, he mentioned firms with introverted with export and import might come across more severe case of exposure. Gönenç, Büyükkara and Koyuncu (2005) supported to Kıymaz's (2003) findings with a study which highlights monthly stock returns of Turkish firms. They concluded either importer or exporter firms are affected only negatively by exchange rate changes.

In their study, Kesriyeli, Özmen and Yiğit (2005) investigated non-financial corporate sector firms balance sheets in Turkey. They discover Turkish firms' liability dollarization is extremely high. High level of foreign currency of Turkish firms makes them more vulnerable to shocks like real exchange rate depreciation. Kesriyeli, Özmen and Yiğit (2005) found out, both sector-specific and macroeconomic variables are statistically significant in explaining the corporate sector liability dollarization. They found out tangibility, leverage ratio, export share and macroeconomic variables like inflation, real exchange rate change is statistically significant in explaining liability dollarization.

2.6. Other Literature

Many scholars have been explored the relationship between exchange rate fluctuations and foreign currency debt. Different point of views formed about relationship between exchange rate and liability dollarization. To give an example, Galindo (2007) suggested that sectors with high level of liability dollarization suffers from depreciation of exchange rate. On the other hand, Bleakley and Cowan (2002) tried to find whether firms with foreign currency debt suffered during devaluations or not. They collected data from 480 firms among Argentina, Brazil and three other Latin American states between 1991 and 1999. They could not find any negative balance sheet effect because it turned out firms tend to match their composition of liabilities with revenues gained from exchange rate difference. They added firms produce trade goods tend to have more foreign currency than other types of firms. Highly dollarized firms benefit from currency depreciations because of fluctuations.

Parallel to their study, Luengnaruemitchai (2004) pointed out there is not a negative relationship between depreciation of currency and balance sheets of highly dollarized, non-financial firms in Asian crises, as these firms compensate their losses from foreign debt, with their exports. Consensus about these discussions is that companies rely on exports boosted after depreciation periods because they benefit more from foreign sales (Forbes, 2002). In other words, companies that export have higher level of dollarization

CHAPTER 3: METHODOLOGY

3.1 Methodological Overview and Study Plan

In this study, we try to find out to what extent asset and liability dollarization of BIST Metal Products, Machinery Index (XMESY) member companies were affected during the Covid-19 Pandemic. In order to find an answer to our question, we formed two panel data estimation models, one is for asset dollarization and one for liability dollarization. In our panel data analysis, both regressions have same explanatory variables, with the exception of one variable, and 480 observations are available for each regressors over 14 time periods. Time period is quarterly time intervals starting from first quarter of 2018 and ends in second quarter of 2021. We also have two dummy variables with the purpose of controlling whether Covid has any effect or not. All 30 companies that are in the XMESY Indices selected and examined comprehensively and inclusively. RStudio software used for forming regressions. Three possible regression models are suitable for our panel data. In order to find the adequate model, relevant test must be done before carrying out with the regression. After choosing the best model for our study, our regression must satisfy the necessary assumptions like Multicollinearity, Stationarity and Heteroskedasticity. Therefore, we conducted tests before interpreting our dependent and explanatory variables. First, we test for Multicollinearity. Explanatory variables should not be highly correlated. Presence of multicollinearity means our variables is highly correlated. In case of strong correlation best variables should be chosen. Variables that cause strong correlation should leave out from regression in order to eliminate any disturbances. Second, we checked for unit root/stationarity test because our variables must be stationary. Lastly, we checked whether our regression is homoscedastic or heteroskedastic. In case of heteroskedasticity we needed to fix heteroscedasticity before running our regression.

3.2 Population/Sample of the Study

Firms that are member of Borsa Istanbul Metal Products, Machinery Index (XMESY) are used for the study. All relevant information about firms is collected from Financial Reports of the relevant firm that are published in Public Disclosure Platform also known as KAP. Since stocks of our firms traded on Borsa Istanbul (BIST) they needed to be audited quarterly by an independent audit company. Our data formed based on these quarterly financial reports and financial statements. One of the firms in XMESY Index did not have the proper financial reports and financial statements so, it is excluded and replaced with another firm that is suitable to our data. All data related to firms are collected from their quarterly financial reports in KAP's website. Selected firms for our data are presented in Table 1.

Table 1. Selected BIST Firms (Source: KAP, 2021)

NO	BIST NAME	COMPANY NAME
1	ALCAR	ALARKO CARRIER SANAYİ VE TİCARET A.Ş.
2	ASUZU	ANADOLU ISUZU OTOMOTİV SANAYİ VE TİCARET A.Ş.
3	ARCLK	ARÇELİK A.Ş.
4	BNTAS	BANTAŞ BANDIRMA AMBALAJ SANAYİ TİCARET A.Ş.
5	BFREN	BOSCH FREN SİSTEMLERİ SANAYİ VE TİCARET A.Ş.
6	DITAS	DİTAŞ DOĞAN YEDEK PARÇA İMALAT VE TEKNİK A.Ş.
7	EGEEN	EGE ENDÜSTRİ VE TİCARET A.Ş.
8	EMKEL	EMEK ELEKTRİK ENDÜSTRİSİ A.Ş.
9	EMNIS*	EMİNİŞ AMBALAJ SANAYİ VE TİCARET A.Ş.
10	FMIZP	FEDERAL-MOGUL İZMİT PİSTON VE PİM ÜR. TES. A.Ş.
11	FROTO	FORD OTOMOTİV SANAYİ A.Ş.
12	FORMT	FORMET METAL VE CAM SANAYİ A.Ş.
13	GEREL	GERSAN ELEKTRİK TİCARET VE SANAYİ A.Ş.
14	IHEVA	İHLAS EV ALETLERİ İMALAT SANAYİ VE TİCARET A.Ş.
15	JANTS	JANTSA JANT SANAYİ VE TİCARET A.Ş.
16	KARSN	KARSAN OTOMOTİV SANAYİİ VE TİCARET A.Ş.
17	KATMR	KATMERCİLER ARAÇ ÜSTÜ EKİP. SAN. VE TİCARET A.Ş.
18	KLMSN	KLİMASAN KLİMA SANAYİ VE TİCARET A.Ş.
19	MAKTK	MAKİNA TAKIM ENDÜSTRİSİ A.Ş.
20	OTKAR	OTOKAR OTOMOTİV VE SAVUNMA SANAYİ A.Ş.
21	PARSN	PARSAN MAKİNA PARÇALARI SANAYİİ A.Ş.
22	SAYAS	SAY YENİLENEBİLİR ENER. EKİP. SAN. VE TİCARET A.Ş.
23	SILVR	SİLVERLİNE ENDÜSTRİ VE TİCARET A.Ş.
24	TOASO	TOFAŞ TÜRK OTOMOBİL FABRİKASI A.Ş.
25	TMSN	TÜMOSAN MOTOR VE TRAKTÖR SANAYİ A.Ş.
26	PRKAB	TÜRK PRYSMİAN KABLO VE SİSTEMLERİ A.Ş.
27	TTRAK	TÜRK TRAKTÖR VE ZİRAAT MAKİNELERİ A.Ş.
28	ULUSE	ULUSOY ELEKTRİK İMALAT TAAHHÜT VE TİCARET A.Ş.
29	VESBE	VESTEL BEYAZ EŞYA SANAYİ VE TİCARET A.Ş.
30	VESTL	VESTEL ELEKTRONİK SANAYİ VE TİCARET A.Ş.

* SAFKAR EGE SOĞUTMACILIK KLİMA SOĞUK HAVA TESİSLERİ İHRACAT İTHALAT SANAYİ VE TİCARET A.Ş. (SAFKR) is removed from panel data due to lack of information and EMNIS is added as its replacement.

3.3. Variables of the Study and Data Sources

Both of our asset dollarization and liability dollarization regression contains same variable with the exception of public offering year variable. Public offering year is used as an explanatory variable in liability dollarization regression; however, it is not used in asset dollarization regression. In addition to that revenues and profit/loss of companies leaved out from regressions because they violate multicollinearity and shows high correlation between other variables. Dependent variable of asset dollarization (ASDO) is calculated by total foreign assets divided by total assets which can be seen on balance sheets of the firms, which is an integral part of these consolidated financial statements. Similarly other dependent variable, liability dollarization (LIADO) is calculated by total foreign liabilities divided by total liabilities and also can be seen balance sheets of the firms.

As far as we know, there is no study for explaining relationship between dollarization and establishment or public offering years of firms. By adding these two variables we test whether there is a relationship between dollarization and age of a company. Establishment year (EY) and public offering year (POY) of firms can be observed from firms quarterly financial reports. It is possible to find a relationship between age of a company or how long the shares have been traded and dollarization level of companies. That is the main reason why we include these variables in our panel data.

There is a relationship between dollarization and employment in manufacturing firms in the literature (Galindo et al. 2007). XMESY companies considered as light industry companies. So, there is a high chance to find a relationship between number of employees and dollarization. Number of employees (EMP) can be observed in financial reports of the firms, collected from KAP.

Leverage ratio, short term foreign currency debt ratio, shares of exports in total sales and tangible asset ratio are subjected to many scholars works. A significant relationship between dollarization and variables listed above was found (Kesriyeli, Özmen and Yiğit 2005). In the light of previous studies in the literature, it is beneficial to add these variables to our regression to understand the dollarization of firms. There are multiple leverage ratios. In this study, by leverage ratio, we refer to financial leverage ratio (LEVR) which is calculated by total liabilities of a company

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divided by total assets of a company. Leverage ratio can be calculated from balance sheets located in financial statements of companies. Short term foreign debt ratio (STFX) is calculated by total foreign debt divided by total debt of a company and also can be calculated from balance sheets located in financial statements of companies. Shares of exports in sales (EXPS) can be calculated by total exports divided by total sales of company. Detailed information about exports collected from sales footnote of the financial reports of the companies. Total sales of a company can be seen either statement of profit or loss and other comprehensive income or sales footnote similar to exports. Tangible asset ratio (TA) is calculated by tangible assets divided by total assets of a company. Tangible asset ratio can be calculated from balance sheets located in financial statements of companies.

Cost of production, revenues, profit/losses of XMESY companies, which trade abroad, are affected by the changes in exchange rates and inflation. These factors can change level of foreign currency in companies and should be included in regression to see if these variables have any impact of dollarization of firms. Cost of production (COST) collected from statement of profit or loss and other comprehensive income or sales footnote located in financial report of firms. Similar to cost of production, revenues of companies (REV) collected from statement of profit or loss and other comprehensive income or sales footnote located in financial report of firms. In panel data of dollarization of this study one unit of both cost of production and revenue corresponds to 100,000 Turkish Liras for simplicity purposes. Profit/loss of companies can be calculated by subtracting cost of production from revenues of companies. One unit of profit/loss also corresponds to 100,000 Turkish Liras.

Exchange rate and inflation have always been on Turkey's agenda. In the literature many scholars examine the relationship between exchange rate, inflation and dollarization (Aklan, 2001; Darıcı, 2004; Hekim, 2008; Saraç, 2010). In our regression, real exchange rate (RECH) is quarterly average real exchange rate between US Dollars and Turkish Lira. Related exchange rate obtained from "EVDS" data central of The Central Bank of the Republic of Turkey (CBRT). Consumer price index (CPI) is consumer price index calculated by Turkish Statistical Institute (TUIK). Base year for consumer price index is 2003, relevant data can be obtained from TUIK's website.

Our regression has two dummy variables first one is Covid 1 Dummy which is a dummy for first quarter of 2020 when Covid-19 Pandemic started. Second dummy is Covid 2 Dummy which is a dummy for fourth quarter of 2020 a time period known for total lockdowns. We suspect breakout of Covid-19 Pandemic and lockdown caused by Covid-19 Pandemic are critical points and they might affect the level of foreign currency because it impales exports and imports and other affairs of states and firms. By the help of these two dummy variables, we try to see whether Covid 19 Pandemic had any effect on liability and asset dollarization of firms.

3.4. Procedures and Statistical Treatment

Depending the number of firms which is in the cross-sectional unit and number of time intervals, there are three possible models that is suitable for panel data regression. First one is fixed effects model, second one is pooling effect model and third one is random effect model. While using fixed effect model, it is assumed something within the firms may impact or bias the independent variables, that should be controlled before conducting any research. Fixed effect model suggests that time-invariant characteristics are unique to each firm and it should not be correlated with other firms' characteristics. If the error terms are correlated, then the fixed effects model is not suitable for further study. In such cases, random effects model should be favored over fixed effects model. If variation throughout firms is not correlated and this variation is random with the explanatory variables, random effect model should be chosen. In other words, if differences across entities have some influence on our independent variable, random effect model should be chosen (Torres-Reyna, 2007). Pooling model is the simplest ordinary least squares (OLS) regression. Lagrange multiplier (LM) model is used to choose between pooled OLS and random effects models. If LM tests indicate a random effect which is null hypotheses of LM test random effect model should be chosen, if null hypothesis is rejected, then pooled OLS model is the adequate model for the panel data statistics. Pooled OLS model means observations do not necessarily refer to same unit. In order to find the best model for the study, first it should be considered whether the observations in our data are random or not. If observations are random, both fixed effects and random effects can be performed. In second step, Hausman Test should be used in order to answer if there is a significant difference in the coefficients. If the answer is yes, fixed effects

model should be chosen, if the answer is no depending outcome of the LM test, we might have to use pooled OLS or random effect model. If observations are not random just using fixed effects should be enough. Before choosing the best model for asset dollarization or liability dollarization, it is beneficial to get familiar with the characteristics of possible models.

3.4.1. The Fixed Effects Estimation Model

In fixed effects estimation model, each residual (u_{it}) accommodates both a specific error for each individual observation (ε_{it}) and a time invariant component (α_i) which is also unit specific. So, fixed effects estimation model can be mathematically expressed as:

$$u_{it} = \alpha_i + \varepsilon_{it}$$

and

$$y_{it} = \alpha_i + X_{it}\beta + \cdots + \gamma_2 D2_{it} + \cdots + \varepsilon_{it} \quad (1)$$

where:

i = Variables that we have in our study

t = Period of time (1, …, n)

y_{it} = Dependent variable

β = Parameters

X_{it} = Vector of independent variables

D = Dummy Variable

ε_{it} = Error term

3.4.2. The Random Effects Estimation Model

In random effects estimation model, each residual (u_{it}) accommodates both a specific error for each individual observation (ε_{it}) and random drawings (v_i) from a given probability distribution So, random effects estimation model can be mathematically expressed as:

$$u_{it} = v_i + \varepsilon_{it}$$

and

$$y_{it} = v_i + X_{it}\beta + \cdots + \gamma_2 D2_{it} + \cdots + \varepsilon_{it} \quad (2)$$

3.4.3. The Pooled OLS Estimation Model

Pooled OLS estimation model can be mathematically expressed as:

$$y_{it} = X_{it}\beta + \cdots + \gamma_2 D2_{it} + \cdots + u_{it} \quad (3)$$

Now that the characteristics of potential models are known, the best model suitable for regression can be selected.

CHAPTER 4: FINDINGS AND INTERPRETATIONS

4.1. Asset Dollarization

Main goal of this section is to find the best model for regression and interpret the findings about asset dollarization. In order to achieve this goal, model that is chosen for the regression must satisfy assumptions such as heteroskedasticity, unit root/stationarity and multicollinearity. After that best model should be chosen with the help of F-Test Lagrange Multiplier Test and Hausmann Test. Lastly, findings will be interpreted.

4.1.1 Testing for Multicollinearity with Variance Inflation Factors

Multicollinearity occurs when at least two variables of a multiple regression model intercorrelate with each other. If there is any multicollinearity among variables, it should reduce the credibility of regression. To examine any correlation coefficients among variables, it is often used two different methods. First one is to form a correlation matrix of the explanatory variables, second and the easier one is using the variance inflation factors.

4.1.1.1.   Correlation matrix

Correlation matrix shows correlation coefficients between variables. Any two variable should not be highly correlated. As it can be observed from Table 2 below, some variables are highly correlated and needs to be extracted from the regressions.

Table 2. Correlation Matrix of the Variables

	EY	POY	EMP	LEVR	STFX	EXPS	TA	RECH	CPI	PL	COST	REV	COV1	COV2
EY	1,00													
POY	0,68	1,00												
EMP	-0,25	-0,29	1,00											
LEVR	-0,20	-0,03	0,22	1,00										
STFX	0,20	-0,02	-0,21	-0,50	1,00									
EXPS	-0,36	-0,30	0,38	0,02	-0,06	1,00								
TA	0,07	0,15	-0,11	0,05	0,13	0,00	1,00							
RECH	0,00	0,00	0,02	0,00	0,12	-0,03	-0,07	1,00						
CPI	0,00	0,00	0,00	0,02	0,02	-0,03	-0,02	-0,04	1,00					
PL	-0,28	-0,28	0,86	0,18	-0,21	0,31	-0,11	0,08	0,00	1,00				
COST	-0,29	-0,29	0,68	0,20	-0,17	0,35	-0,08	0,07	-0,01	0,82	1,00			
REV	-0,29	-0,30	0,74	0,20	-0,19	0,35	-0,09	0,07	-0,01	0,88	0,99	1,00		
COV1	0,00	0,00	0,00	0,02	-0,03	-0,01	0,01	0,16	-0,09	-0,02	-0,03	-0,03	1,00	
COV2	0,00	0,00	0,01	-0,01	0,03	-0,03	-0,03	0,29	0,21	0,13	0,12	0,12	-0,08	1,00

Profit/Loss variable is highly correlated with number of employees, cost of production and revenues of companies. In the light of this knowledge, it is beneficial to leave out profit/loss of the regression. Similar to this situation, we observe strong correlation between cost of production and revenues of companies. It is not possible to run our regression without ruling out multicollinearity. It is necessary to decide which variables should be removed from the regression. To support this statement, we run different regressions whether it is better to choose profit/loss or other variables. This comparison can be found in Table 13 located under section 4.1.5. After cleansing our regression from unnecessary variables, we continue with our assumptions. As it can be observed from the heatmap of variables in Figure 1, correlation between any two variable is pretty small which should indicate there is no strong correlation among any two variables of ASDO regression anymore. It is safe to say there is no multicollinearity in our model.
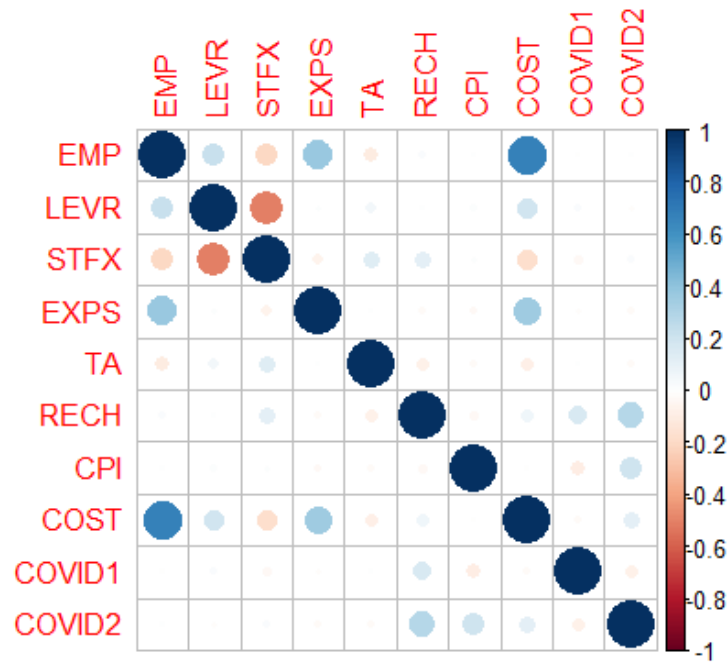
Figure 1. Correlations Matrix of the Variables of Asset Dollarization

4.1.1.2. *Variance Inflation Factors (VIFs)*

Second and the easier way of controlling whether there is any high multicollinearity exist or not is the Variance Inflation Factor. In econometrics if VIF value is bigger than 10, that means there is a multicollinearity between at least two variables. The VIFs for each variable of ASDO regression can be seen below in the Table 2. As it can be seen, all VIFs values of the variables of ASDO regression is less than 10. So, it can be suggested that there is no multicollinearity between any two variables of ASDO regression.

Table 3. Variance Inflation Factors for Resource Variables of Asset Dollarization

	EMP	LEVR	STFX	EXPS	TA	RECH	CPI	COST	COV.1	COV.2
VIF	1.9998	1.4277	1.4439	1.2082	1.0640	1.1808	1.0652	1.9585	1.0540	1.1900

4.1.2 Panel Unit Root Test and Stationarity

Regression model should be stationary because most of the necessary statistical tests depend on regression being stationarity. If properties of a time series do not change over time, that means it is a stationary panel regression. Stationarity can be checked with the help of Dickey-Fuller Test.

Hypothesis of Dickey-Fuller Test:

H_0: There exists a unit root in model. (Means our series is not stationary.)

H_1: There is no unit root in model. (Means series is stationary.)

Table 4. Augmented Dickey-Fuller Test for Panel Unit Root Test and Stationarity

Variables of ASDO	Dickey-Fuller TEST	Order of Integration
Number of Employees	-3.4973***	Stationary, no unit root presence
Leverage Ratio	-4.7803***	Stationary, no unit root presence
Short Term FX Ratio	-5.7133***	Stationary, no unit root presence
Export/Total Sales	-4.277***	Stationary, no unit root presence
Tangible Assets Ratio	-5.1328***	Stationary, no unit root presence
Real Exchange Rate	-11.237***	Stationary, no unit root presence
Consumer Price Index	-16.272***	Stationary, no unit root presence
Cost of Production	-5.3515***	Stationary, no unit root presence
Covid1 Dummy	-13.886***	Stationary, no unit root presence
Covid 2 Dummy	-13.819***	Stationary, no unit root presence

Rejection of the null hypothesis at 10%, 5% and 1% level of significance indicated by *, **, *** respectively.

In ASDO regression, all ADF test of variables results are less than zero, in addition to that their corresponding p-values are less than 0.01. Since our p-values are extremely close to zero, it is safe to say null hypothesis should be rejected, which suggests existence of an integrated series, and accept alternative hypothesis which suggests variables of the regression are stationary.

4.1.3 Testing for Heteroskedasticity

In order to continue our study, heteroskedasticity should be controlled. Presence of heteroskedasticity means selected regression is no longer the best model for explaining asset dollarization and there might be more efficient regression available for interpretation. For the purpose of controlling whether a regression is heteroskedastic or not, Breusch-Pagan test is used. The null hypothesis of BP Test indicates that, test error variances are same. On the other hand, alternative hypothesis indicates error variances are not same.

Table 5. Breusch-Pagan Test Results for Heteroskedasticity

Breusch-Pagan test statistic	P - Value
BP = 38.406	3.224e-05

After Breusch-Pagan test, it can be observed that p-value is less than 0.05. The null hypothesis should be rejected, which implies regression is homoscedastic, therefore we face with heteroskedasticity. In such cases robust standard errors must be used in order to purify selected model from heteroskedasticity. With the help of robust covariance matrix estimation, also known as Sandwich Estimator, heteroskedasticity consistent coefficients should be calculated. Since selected model regression based on fixed effects model, it is more accurate to use Arellano–Bond estimator.

Table 6. Test Results for Heteroskedasticity

	P- Values of Before Tests	P- Values of Heteroskedasticity Consistent Coefficients
Number of Employees	0.033346 *	0.030279 *
Leverage Ratio	0.003852 **	0.009658 **
Short Term FX Ratio	0.317044	0.545336
Export/Total Sales	5.38e-05 ***	0.186519
Tangible Assets Ratio	2.2e-16 ***	0.000174 ***
Real Exchange Rate	0.273450	0.501945
Consumer Price Index	0.980943	0.977395
Cost of Production	0.194339	0.085323
Covid1 Dummy	0.662832	0.504557
Covid 2 Dummy	0.447664	0.265234

*Note: Significance Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' '*

After necessary adjustments, estimation of all variables remains the same. However, significance of some variables changed drastically. In addition to that, Year of Establishment deducted from the equation. Significance levels of variables should be interpreted in the light of P- Values of heteroskedasticity consistent coefficients.

4.1.4 Choosing the Best Panel Data Estimation Model for ASDO

As it is mentioned before in methodology section of this paper, the best model between pooled OLS estimation model, fixed effects model and random effects model should be chosen. In this section comparison of these three models mentioned above and best model for estimating asset dollarization can be found.

4.1.4.1. Choosing Between Fixed Effects Model and Pooled OLS Estimation Model

F-test is used to decide which model is better. The null hypothesis favors pooled OLS model, however since the P-Value is less than 0.05, it indicates the null hypothesis should rejected and alternative hypothesis which favors fixed effects model over pooled OLS model, should be accepted.

Hypotheses of F Test:

$H_0: a_1 = \alpha_2 = \cdots = \alpha_n$ i.e., intercepts of all units are same

$H_1: \alpha_1 \neq \alpha_2 \neq \cdots \neq \alpha_n$ i.e., intercepts of all units are not same, they are different from each other

Table 7. Test Results for Choosing Between Fixed Effects and Pooled OLS Model

F Statistics Value	P - Value
F = 43.702	< 2.2e-16

4.1.4.2. Choosing Between Random Effects Model and Pooled OLS Estimation Model

Lagrange Multiplier Test is used to decide between random effect models and pooled OLS estimation model. The null hypothesis favors pooled OLS model, however since the P-Value is less than 0.05, it indicates null hypothesis should be rejected and alternative hypothesis, which favors random effects model over pooled OLS estimation model, should be accepted.

Hypotheses of Lagrange Multiplier Test:

$H_0: Var(v_i) = 0$ (Choose Pooled OLS Estimation Model)

$H_1: Var(v_i) \neq 0$ (Choose Random Effects Models)

Table 8. Test Results for Choosing Between Random Effects and Pooled OLS Model

Lagrange Multiplier Test	P - Value
normal = 35.943	< 2.2e-16

4.1.4.3. Hausman Test for Choose Between Fixed Effects and Random Effect Models

So far, we favored fixed effects model instead of pooled OLS model with the help of F Test and we also favored random effects model instead of pooled OLS model. One last test needed to be conducted in order to choose the adequate model between random effects model and fixed effects model. Hausman Test is used for this purpose. The null hypothesis of Hausman Test favors random effects model instead of fixed effects Model, the alternative hypothesis favors fixed effects model over random effect model. As it can be observed in the Table 4, P-Value of the statistics is less than 0.05. So, it is safe to say we can reject the null hypothesis so we end up choosing fixed effects model as the bets model for asset dollarization.

Hypotheses of Hausman Test:

H_0: the GLS estimates are consistent i.e $Cov(x_{it}, v_i) \neq 0$

H_1: the GLS estimates are inconsistent i.e $Cov(x_{it}, v_i) = 0$

Table 9. Hausman Test Results for Choosing Between Random Effects and Fixed Effects Model

Hausman test statistic H	P - Value
chisq = 44.53	2.643e-06

After F-Test, Lagrange Multiplier Test and Hausman Test fixed effects model is the best model for our regression.

Table 10. Descriptive Statistics for all Variables

Variable	Mean	Minimum	Maximum	Std. Dev.
Establishment Year	1975	1954	2005	13.8
Number of Employees	3,093	54	36,747	6,568
Leverage Ratio	0.5976	0.0840	1.5904	0.2490
Short Term FX Ratio	0.7714	0	1	0.2545
Export/Total Sales	0.4259	0	0.921	0.3075
Net Tangible Assets Ratio	0.2256	0.0098	0.6925	0.1527
Real Exchange Rate	5.7956	3.8094	7.8692	1.1699
Consumer Price Index	0.0135	0.0027	0.0305	0.0072
Cost of Production	20,916.12	3,671.50	432,648.78	52,611.9
Revenues	26,296.32	67,977.74	494,514.07	65,097.7
Profit/Loss for the Period	5,380.198	-32.35	138,063.73	14,627.3

N=420

Establishment Year show the year that our selected firms founded. It varies between 1975 and 2005. Number of Employees shows how many employees working at the time of this study.

Leverage Ratio refers to financial leverage in our study which is calculated by Total debts of a firm divided by total assets of a company. It is expected that the financial leverage ratio will be high in industrial companies and low in technology companies. An average of 50% leverage is considered normal. As it can be seen from selected firms generally consistent of light industry companies which makes our mean of 59% reasonable. In one extraordinary case one of the firms that is selected has an equity less than zero because of its previous year's loss and loss of the period are deducted from its equity which enables to a firm to have more debt than asset. (159% in our case)

Short Term FX Ratio show how much foreign debt of a company due within 1 year or less. In Turkey companies tend to have more foreign debt in short-run. In our data, we can see the average rate of short-term foreign debt is around 77%. Some

companies have no short run foreign debt in some periods that is why our minimum is 0. We also have companies that their entire foreign debt is due within 1 year.

Export rate average of our 30 selected companies lies around 42%. In our data we have highly export dependent companies, we also have some companies does not have abroad sales.

Tangible assets one of the components that form a firm's assets. Net Tangible Assets Ratio can be useful to understand the structure of a company. On our data on average 22% of assets are tangible assets.

Real Exchange Rates between 31th of March 2018 and 30th of June 2021 are used in our study. Rates that we used are exchange rate between US Dollars and Turkish Liras. Smallest exchange rate is 1\$ for 3.8094₺ (31th of March 2018) and largest exchange rate is 1\$ for 7.8692₺. (30th of June 2021)

Consumer Price Index. Consumer Price Index form by TURKSTAT and it is percentage change for quarterly time periods.

Cost of Production is the expenses for producing material goods. Each unit is 100,000 Turkish Lira which means every firms averagely 2,091,612,000 Turkish Liras in order to manufacture their goods. Revenues refers revenues of firm that they make from sales. Each unit is 100,000 Turkish Lira which means every firms averagely 2,629,632,000 Turkish Liras in from their sales. Profit/Loss of companies basically the difference between revenue and production cost from manufactured goods. Positive number means profit, on the other hand if profit/loss is negative it refers that firm suffered a loss for that period. Revenues and profit/loss leaved out from regression because they have a strong correlation between some other variables of the regression.

4.1.5 Fixed Effect Model Panel Data Regression and Coefficients Analysis of Asset Dollarization

Hence, we choose the best model for our regression and run necessary tests, it is time include our dependent variable (Asset Dollarization), the independent variables (EMP, LEVR, EXPS, STFX, TA, RECH, CPI, COST, COVID1, COVID2), and run our regression using the fixed effects estimation model:

Let's recall fixed effect model formulation in section 3.4:

$$y_{it} = \alpha_i + X_{it}\beta + \cdots + \gamma_2 D2_{it} + \cdots + \varepsilon_{it} \quad (4)$$

After plugging variables into our regression:

$$ASDO_{it} = \alpha_i + EMP_{it}\beta_1 + LEVR_{it}\beta_2 + EXPS_{it}\beta_3 + STFX_{it}\beta_4 + TA_{it}\beta_5 \\ + RECH_{it}\beta_6 + CPI_{it}\beta_7 + COST_{it}\beta_8 + COVID1_{it}\gamma_2 + COVID2_{it}\gamma_3 \\ + \varepsilon_{it}$$

$$(5)$$

Table 11. Description of the Assets Dollarization Model

Variables	Description
ASDO	Asset Dollarization Percentage
EMP	Number of Employee
LEVR	Leverage Ratio
EXPS	Export/Total Sales
STFX	Short Term FX Ratio
TA	Net Tangible Assets Ratio
RECH	Real Exchange Rate
CPI	Consumer Price Index
COST	Cost of Production
COVID1	Dummy for 30.06.2020 Time Period
COVID2	Dummy for 31.12.2020 Time Period

Table 12. Regression of Asset Dollarization on Explanatory Variables

	Estimation	Std. error	Significance Level
CONSTANT	0.3506156	0.0468845	
EMP	0.0000116	0.0000054	*
LEVR	-0.1175484	0.0451937	**
STFX	-0.0190447	0.0314629	
EXPS	0.1301989	0.0983868	
TA	-0.1301989	0.1645110	***
RECH	0.0032229	0.0047954	
CPI	0.0102823	0.3626484	
COST	-0.0000002	0.0000001	
COVID1	0.0052211	0.0078163	
COVID2	0.0097355	0.0087255	
# of Observations	420		F-statistic: 10.9108
Time Periods	14		R-Squared: 0.2230

*Note: Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

After the coefficients plugged into regression:

$$
\begin{aligned}
ASDO_{it} = 0.3506156 +\ & 0.0000116\,EMP_{it} \\
& - 0.1175484\,LEVR_{it} - 0.0190447\,STFX_{it} + 0.1301989\,EXPS_{it} \\
& - 0.1301989\,TA_{it} + 0.0032229\,RECH_{it} + 0.0102823\,CPI_{it} \\
& - 0.0000002\,COSTI_{it} + 0.0052211\,COVID1_{it} \\
& + 0.0097355\,COVID2_{it} + SE + \varepsilon_{it}
\end{aligned}
$$
(6)

4.1.5.1.   Coefficient Analysis

From looking our fixed effect regression, it is safe to say 3 variables are statistically significant explaining asset dollarization. In other words, our explanatory variables number of employee, leverage ratio and tangible asset ratio have a significant impact on our regression. Unfortunately, other variables and any of our dummy have no significance explaining asset dollarization.

Number of employees have a positive relationship between asset dollarization. By increasing number of employees, firms increase their expenses because they need to pay their workers' salaries and insurances. Depreciation in Turkish currency leads to increase in minimal wages in Turkey. Even a 10% increase in wages means firms bear more cost and need to increase price of their products accordingly. Companies that need more resources have chosen to borrow in the short term often in foreign currency.

Parallel to Kesriyeli, Özmen and Yiğit's (2005) findings leverage ratio (LEVR), and tangible asset ratio (TA) have a significant relationship explaining dollarization in our regression. However, shares of exports (EXPS) have no statistical impact on asset dollarization. First of all, higher leverage ratios can severely limit a firm's capacity to borrow in both local and foreign currencies. A negative LEVR coefficient can be interpreted in this context as firms find it more difficult to borrow in foreign currencies, while a positive LEVR coefficient indicates that they find it more difficult to borrow in domestic currencies. In this context, negative coefficient means our selected companies prefer to borrow in Turkish Lira instead of foreign currency and the thus their dollarization decreases. One percent increase in leverage ratio causes asset dollarization to decrease by approximately 0.11%. Tangible asset ratio has an inverse relationship with asset dollarization. Every percentage increase in tangible assets ratio, decreases dollarization by approximately 0.62%. In Turkish Tax Procedure Law, tangible assets accounted as Turkish Lira in the asset side of the balance sheet. From this perspective, it is only logical to observe a decrease in asset dollarization, if there is an increase in the local currency of the balance sheet. The same cannot be said for foreign currency entering the company as the percentage of exports increases. It shows that higher level of exports does not have significant effect on asset dollarization.

Cost of production has no statistically significant relationship with asset dollarization. Relationship between cost of production and asset dollarization shows that there is no definite answer to the question whether firms bear costs in local currencies or foreign currency.

Most of the literature suggest a significant relationship between real exchange rate, consumer price index and dollarization. However, in this case there is not enough evidence to support a significant relationship between asset dollarization of companies' member of metal products, machinery index in Turkey and these variables. Most of the companies examined in this index produce durable household appliances or motor vehicles. Their sales boomed in Covıd-19 Pandemic as people spend more time at home, and avoid public transportation causing both sales and expenses of these companies to increase. Positive effects from sales neutralizes downsides of inflation and exchange rate. So, these companies were not affected by inflation and exchange rates. Dummy for second quarter of 2020, corresponds to the breakthrough of the Covid-19 Pandemic, and dummy for fourth quarter of 2020, corresponds to the total lockdown of Covid-19 Pandemic, are not statistically significant. It could be stated that important milestones of Covid-19 Pandemic have no impact on dollarization of asset side of the balance sheets of XMEST companies. Most of the firms in XMEST Index benefit from Coivd-19 Pandemic because consumers choose or have to spend more time in their houses. Since they spend more time at home, the products that XMESY companies produce began to appeal to them. (i.e., household appliances, electronic devices, etc.) Increase in firms' sales neutralized the negative side of Covid-19 over companies. This is the main reasons why Covid-19 has no impact of dollarization level of companies.

4.1.5.2.   *Comparative Regressions of Asset Dollarization*

In this section different regressions are used to illustrate which variables are more suitable for the regression. In other words, this section tries to answer why selected regression is better explaining asset dollarization other than regressions. Results can be observed in the Table 13 below. All given regression in Table 13 contains heteroskedasticity consistent coefficients. Since our regressions utilize fixed effects models, Arellano–Bond estimator used while purifying from heteroskedasticity.

Table 13. Comparative Regressions of Asset Dollarization

Variables	Reg 1	Reg2	Reg 3	Reg 4	Reg 5
PL	-	-	-0.00000001	-	-0.0000004
REV	-	-	-	-0.0000001	-
EMP	0.0000116*	-	-	0.0000119*	0.0000119
COST	-0.0000002	-	-	-	-
LEVR	-0.1175484**	-0.1173266*	-0.11738773*	-0.1172973**	-0.1159079*
STFX	-0.0190447	-0.0199244	-0.01994253	-0.0189171	-0.0184700
EXPS	0.1301989	0.1316767	0.13170487	0.1305040	0.1312448
TA	-0.6237600***	-0.621202***	-0.6212212***	-0.623497***	-0.621739***
RECH	0.0032229	0.0043536	0.00436327	0.0032071	0.0031397
CPI	0.0102823	0.0593624	0.05871052	0.0124227	0.0294264
COVID1	0.0052211	0.0046399	0.00462057	0.0053084	0.0057306
COVID2	0.0097355	0.0060579	0.00614687	0.0097494	0.0085625
R-sqr	0.22308	0.21216	0.21216	0.22277	0.22094
F-stat	10.9108	12.8586	11.4001	10.8918	10.7765
AIC	-1176.855	-1174.994	-1172.995	-1176.692	-1175.7
N	420	420	420	420	420

Note: Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

In order to find the best regression for asset dollarization, adequate variables should be chosen. First regression is the selected regression for asset dollarization in this study. In second regression number of employees, revenue, profit/loss and cost of production leaved out from the equation. Similarly, in the third regression only has profit/loss variable, cost of production, revenue and number of employee variables are leaved out from the equation. In the fourth regression profit/loss and cost of production variables are leaved out from regression. In the fifth regression revenue and cost of production variables leaved out from regression. Although, regressions have different outcomes and significance levels, leverage ratio and tangible asset ratio are statistically significant. First regression is the better and most precise regression, main reason of this is first regression has the lowest Akaike's Information Criteria (AIC) value which indicates our model fits data better and shows first regression is better explaining asset dollarization. In the light of our findings, we

should proceed with first regression and test for stationary and heteroskedasticity in order to pursue an explanation about asset dollarization.

4.2. Liability Dollarization

Main goal of this section is to find the best model for regression and interpret the findings about liability dollarization. In order to achieve this goal, model that is chosen for the regression must satisfy assumptions such as heteroskedasticity, unit root/stationarity and multicollinearity. After that best model should be chosen with the help of F-Test Lagrange Multiplier Test and Hausmann Test. Lastly, findings will be interpreted.

4.2.1   Testing for Multicollinearity with Variance Inflation Factors

4.2.1.1. Correlation matrix

Correlation matrix shows correlation coefficients between variables. Any two variable should not be highly correlated. Similar to asset dollarization multicollinearity shown under section 4.1.1. should be eliminated. In order to tackle this obstacle, comparison of different regression can be found in Table 24 located under section 4.2.5. After cleansing selected model regression from unnecessary variables, we continue with our assumptions. As it can be observed from the heatmap of variables in Figure 2 correlation between any two variable is pretty small which should indicate there is no strong correlation among any two variables of LIADO regression It is safe to say there is no multicollinearity in our model.
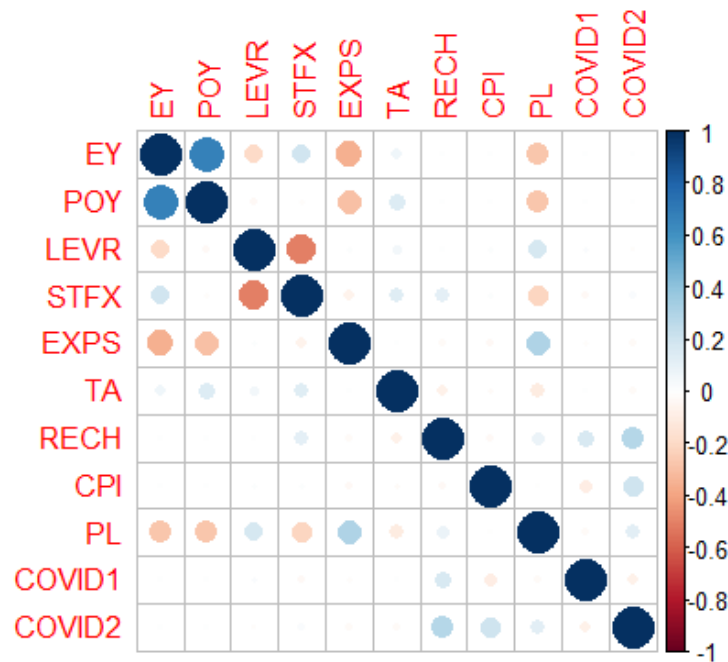
Figure 2**.** Correlations Matrix of the Variables of Liability Dollarization

4.2.2.2 Variance Inflation Factors (VIFs)

Second and the easier way of controlling whether there is any high multicollinearity exist or not is the Variance Inflation Factor. In Econometrics if and VIF is bigger than10, that means there is a multicollinearity between at least two variables. The VIFs for each variable of LIADO regression can be seen below in the Table 4. As we can see all VIF values of the variables of LIADO regression is less than 10. So, we can suggest that there is no multicollinearity between any two variables of LIADO regression. In case of any multicollinearity, VIFs of variables which highly correlate with each other should exceed 10.

Table 14. Variance Inflation Factors for Resource Variables of Asset Dollarization

	EY	POY	LEVR	STFX	EXPS	TA	RECH	CPI	COV1	COV2
VIF	2.14	2.00	1.41	1.51	1.16	1.09	1.18	1.06	1.05	1.16

4.2.2 Panel Unit Root Test and Stationarity

Regression model should be stationary because most of the necessary statistical tests depend on regression being stationarity. If properties of a time series do not change over time, that means it is a stationary panel regression. Stationarity can be checked with the help of Dickey-Fuller Test.

Hypothesis of Dickey-Fuller Test:

H_0: There exists a unit root in model. (Means our series is not stationary.)

H_1: There is no unit root in model. (Means series is stationary.)

Table 15. Augmented Dickey-Fuller Test for Panel Unit Root Test and Stationarity

Variables of ASDO	Dickey-Fuller TEST	Order of Integration
Year of Establishment	-3.9313***	Stationary, no unit root presence
Public Offering Year	-4.2222***	Stationary, no unit root presence
Leverage Ratio	-4.7803***	Stationary, no unit root presence
Short Term FX Ratio	-5.7133***	Stationary, no unit root presence
Export/Total Sales	-4.277***	Stationary, no unit root presence
Tangible Assets Ratio	-5.1328***	Stationary, no unit root presence
Real Exchange Rate	-11.237***	Stationary, no unit root presence
Consumer Price Index	-16.272***	Stationary, no unit root presence
Covid1 Dummy	-13.886***	Stationary, no unit root presence
Covid 2 Dummy	-13.819***	Stationary, no unit root presence

Rejection of the null hypothesis at 10%, 5% and 1% level of significance indicated by *, **, *** respectively.

In LIADO regression, all ADF test of variables results are less than zero, in addition to that their corresponding p-values are less than 0.01. Since p-values are extremely close to zero, it is safe to say null hypothesis should be rejected, which suggests existence of an integrated series, and accept alternative hypothesis which suggests variables of the regression are stationary.

4.2.3 Testing for Heteroskedasticity

In order to continue our study, heteroskedasticity should be controlled. Presence of heteroskedasticity means selected regression is no longer the best model for explaining liability dollarization and there might be more efficient regression available for interpretation. For the purpose of controlling whether a regression is heteroskedastic or not, Breusch-Pagan test is used. The null hypothesis of BP Test indicates that, test error variances are same. On the other hand, alternative hypothesis indicates error variances are not same.

Table 16. Breusch-Pagan Test Results for Heteroskedasticity

Breusch-Pagan test statistic	P - Value
BP = 60.902	2.446e-09

After Breusch-Pagan test, it can be observed that p-value is less than 0.05. The null hypothesis should be rejected, which implies regression is homoscedastic, therefore we face with heteroskedasticity. In such cases robust standard errors must be used in order to purify selected model from heteroskedasticity. With the help of robust covariance matrix estimation, also known as Sandwich Estimator, heteroskedasticity consistent coefficients should be calculated.

Table 17. Heteroskedasticity Consistent Coefficients of Liability Dollarization

	P- Values of Before Tests	P- Values of Heteroskedasticity Consistent Coefficients
Intercept	0.59467	0.61942
Year of Establishment	0.09054	0.10470
Public Offering Year	0.10077	0.02502 *
Leverage Ratio	0.00251 **	0.09414
Short Term FX Ratio	0.00000 ***	0.11083
Export/Total Sales	0.02982 *	0.02749 *
Net Tangible Assets Ratio	0.00038 ***	0.03006 *
Real Exchange Rate	0.00374 **	0.08579
Consumer Price Index	0.16068	0.06670
Covid1 Dummy	0.32293	0.36294
Covid 2 Dummy	0.12002	0.06284

*Note: Significance Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

After necessary adjustments estimation of all variables remain the same. However, significance of some variables changed drastically. We should interpret significance in the light of P- Values of heteroskedasticity consistent coefficients.

4.2.4. *Choosing Panel Data Estimation Model for LIADO*

As it is mentioned before in methodology section of this paper, the best model between pooled OLS estimation model, fixed effects model and random effects model should be chosen. In this section comparison of these three models mentioned above and best model for estimating asset dollarization can be found.

4.2.4.1 *Choosing Between Fixed Effects Model and Pooled OLS Estimation Model*

F-test is used to decide which model is better. The null hypothesis favors pooled OLS model, however since the P-Value is less than 0.05, it indicates the null hypothesis should rejected and alternative hypothesis which favors fixed effects model over pooled OLS model, should be accepted.

Hypotheses of F Test:

$H_0: a_1 = \alpha_2 = \cdots = \alpha_n$ i.e., intercepts of all units are same

$H_1: \alpha_1 \neq \alpha_2 \neq \cdots \neq \alpha_n$ i.e., intercepts of all units are not same, they are different from each other

Table 18. Test Results for Choosing Between Fixed Effects and Pooled OLS Model

F Statistics Value	P - Value
F = 21.25	< 2.2e-16

4.2.4.2. *Choosing Between Random Effects Model and Pooled OLS Estimation Model*

Lagrange Multiplier Test is used to decide which model is better. The null hypothesis favors pooled OLS model over random effect model, however since the P-Value is less than 0.05, it indicates that the null hypothesis should be rejected and the alternative hypothesis, which favors random effects model over pooled OLS Model should be accepted.

Hypotheses of Lagrange Multiplier Test:

$H_0: Var(v_i) = 0$

$H_1: Var(v_i) \neq 0$

Table 19. Test Results for Choosing Between Random Effects and Pooled OLS Model

Lagrange Multiplier Test	P - Value
normal = 28.995	< 2.2e-16

4.2.4.3. Hausman Test for Choose Between Fixed Effects and Random Effect Models

So far, we favored Fixed Effects Model instead of Pooled OLS model with the help of F Test and we also favored Random Effects Model instead of Pooled OLS model. One last test needs to be conducted in order to choose the adequate model between Random Effects Model and Fixed Effects Model. Hausman Test is used for this purpose. The null hypothesis of Hausman Test favors Random Effects Model instead of Fixed Effects Model, the alternative hypothesis favors fixed effects model. As it can be seen in the Table 14 below, P-Value of our statistics is bigger than 0.05 so we can safely say we cannot reject the null hypothesis so we end up choosing Random Effects Model.

Hypotheses of Hausman Test:

H_0: the GLS estimates are consistent i.e $Cov(x_{it}, v_i) \neq 0$

H_1: the GLS estimates are inconsistent i.e $Cov(x_{it}, v_i) = 0$

Table 20. Hausman Test Results for Choosing Between Random Effects and Fixed Effects Model

Hausman test statistic H	P - Value
chisq = 3.8883	0.8671

After F-Test, Lagrange Multiplier Test and Hausman Test random effects model is the best model for our regression.

Table 21. Descriptive Statistics for all Variables

Variable	Mean	Minimum	Maximum	Std. Dev.
Establishment Year	1975	1954	2005	13.8
Number of Employees	3,093	54	36,747	6,568
Leverage Ratio	0.5976	0.0840	1.5904	0.2490
Short Term FX Ratio	0.7714	0	1	0.2545
Export/Total Sales	0.4259	0	0.921	0.3075
Net Tangible Assets Ratio	0.2256	0.0098	0.6925	0.1527
Real Exchange Rate	5.7956	3.8094	7.8692	1.1699
Consumer Price Index	0.0135	0.0027	0.0305	0.0072
Cost of Production	20,916.12	3,671.50	432,648.78	52,611.9
Revenues	26,296.32	67,977.74	494,514.07	65,097.7
Profit/Loss for the Period	5,380.198	-32.35	138,063.73	14,627.3

N=480

Descriptions for the statistical variables are same with the descriptions that is explained earlier in the section 4.1.1 under the Table 10. with the addition of public offering year.

4.2.5 Random Effect Panel Data Regression and Coefficients Analysis of Liability Dollarization

Since random estimate model is the best model for the liability dollarization regression, necessary tests similar to asset dollarization regression needed to be done. It is time to include our dependent variable (Liability Dollarization Percentage), independent variables (EY, POY, LEVR, EXPS, STFX, TA, RECH, CPI, COVID1, COVID2), and run our regression using the random effects estimation model.

Let's recall random effect model formula in section 3.4:

$$y_{it} = v_i + X_{it}\beta + \cdots + \gamma_2 D2_{it} + \cdots + \varepsilon_{it}$$

After plugging variables into our regression:

$$LIADO_{it} = v_i + EY_{it}\beta_1 + POY_{it}\beta_2 + LEVR_{it}\beta_3 + STFX_{it}\beta_4 + EXPS_{it}\beta_5 + TA_{it}\beta_6 \\ + RECH_{it}\beta_7 + CPI_{it}\beta_8 + COVID1_{it}\gamma_2 + COVID2_{it}\gamma_3 + \varepsilon_{it}$$

$$(7)$$

Table 22. Description of the Liability Dollarization Model

Variables	Description
LIADO	Liability Dollarization Percentage
EY	Year of Establishment
POY	Public Offering Year
LEVR	Leverage Ratio
EXPS	Export/Total Sales
STFX	Short Term FX Ratio
TA	Net Tangible Assets Ratio
RECH	Real Exchange Rate
CPI	Consumer Price Index (2003=100)
COVID1	Dummy for 30.06.2020 Time Period
COVID2	Dummy for 31.12.2020 Time Period

Table 23. Regression of Liability Dollarization on Explanatory Variables

	Estimation	Std. error	Significance Level
Constant	2.9189359	5.8725081	
EY	0.0048608	0.0029892	
POY	-0.0059717	0.0026548	*
LEVR	0.2068302	0.1232697	
STFX	-0.2235739	0.1399148	
EXPS	0.1183445	0.0534926	*
TA	-0.4214345	0.1935971	*
RECH	-0.0162008	0.0094072	
CPI	1.1834601	0.6436838	
COVID1	-0.0232029	0.0254756	
COVID2	-0.0383135	0.0205388	
# of Observations	420		Chisq: 105.26
Time Periods	14		R-Squared: 0.2046

Note: Significance Codes: 0.001 '***', 0.01 '**', 0.05 '*', 0.1

After the coefficients plugged into regression:

$$
\begin{aligned}
LIADO_{it} = {} & 2.9189359 + 0.0048608\, EY_{it} - 0.0059717\, POY_{it} + 0.2068302\, LEVR_{it} \\
& - 0.2235739\, STFX_{it} + 0.1183445\, EXPS_{it} \\
& - 0.4214345\, TA_{it} - 0.0162008\, RECH_{it} + 1.1834601\, CPI_{it} \\
& - 0.0232029\, COVID1_{it} - 0.0383135\, COVID2_{it} + SE + \varepsilon_{it}
\end{aligned}
$$

(8)

4.2.5.1. *Coefficient Analysis*

According to the result of Random Effect Regression, it is safe to say 3 variables statistically significant explaining liability dollarization. These variables are public offering year, share of exports in total sales and tangible asset ratio. As far as we know, there is no study for explaining relationship between liability dollarization and establishment year or public offering year of firms. Here we can observe a significant and a negative relationship between public offering year and liability dollarization of firms in of metal products, machinery index in Turkey. Older companies in BIST can become more dollarized because they have more liquidity and financing than newly public offering companies. They are also more credible and corporate which makes it easier to take foreign currency credit from banks.

Parallel to Kesriyeli, Özmen and Yiğit's (2005) findings, shares of exports in total sales (EXPS) and tangible asset ratio (TA) have a significant relationship explaining dollarization in our regression. On the other hand, unlike their findings there is not a statistically significant relationship between leverage ratio and liability dollarization. It is seen that a positive coefficient on share of the exports in total sales meaning firms tends to match the income structure of the sector with its liabilities. The same can be said for foreign currency entering the company as the percentage of exports increases. It shows that firms with higher foreign currency income and benefiting from depreciation in FX have more FX debt. One percent increase in share of the exports in total sales causes lability dollarization to increase by approximately 0.11%.

Similar to relationship between asset dollarization tangible asset ratio, tangible asset ratio has an inverse relationship with liability dollarization. However, the reasons of these two decreases are different. As it may be more difficult for a creditor to liquidate a tangible asset in order to collect a foreign currency debt, higher tangible asset ratio can be expected to increase the share of local currency debt while reducing the share of foreign currency debt. As one percent increase in tangible asset ratio causes liability dollarization decreases by approximately 0.42%.

Real exchange rate (RECH) and consumer price index (CPI) has no statistically significant relationship with liability dollarization. Though we assume increase in real exchange rate or inflation would cause increase in dollarization at first glance, unlike common belief in the literature there is not enough evidence to support this belief for XMEST firms.

Dummy representing fourth quarter of 2020 lockdown and dummy representing first quarter period of Covid-19 Pandemic is not statistically significant. Which means Covid-19 do not have an impact on liability dollarization of XMESY firms. During Covid-19 individuals spent more time in their houses and demand for products like electrical appliances and household appliances. increased sales provided liquidity to XMESY companies which helps to overcome the obstacles caused by Covid-19 In addition to that there is not enough evidence to support any relationship between number of employees, short-term foreign debt ratio, year of establishment and liability dollarization.

4.2.5.2.   Comparative Regressions of Liability Dollarization

In this section different regressions are used to illustrate which variables are more suitable for our regression. In other words, this section tries to answer why our regression better explaining liability dollarization other than regression. Results can be observed from the Table 24 below. All given regressions in Table 24 contains heteroskedasticity consistent coefficients.

Table 24. Comparative Regressions of Liability Dollarization

Variables	Reg 1	Reg2	Reg 3	Reg 4
PL	-	-	-	0.00000031
REV	-	-	0.00000006	-
EMP	-	-0.0000003	-	-
COST	-	0.0000001	-	-
EY	0.0048608	0.0048733	0.00488937	0.00490496
POY	-0.0059717*	-0.0059516*	-0.00590931*	-0.00590732*
LEVR	0.2068302	0.2055462	0.20573710	0.20727272
STFX	-0.2235739	-0.2234845	-0.22328504	-0.22300282
EXPS	0.1183445*	0.1166629*	0.11634354*	0.11702927*
TA	-0.4214345*	-0.4207462*	-0.42029552*	-0.42039863*
RECH	-0.0162008	-0.0163005	-0.01635841	-0. 01641829
CPI	1.1834601	1.2000710	1.19999725	1. 19827389
COVID1	-0.0232029	-0.0227993	-0.02274387	-0. 02275885
COVID2	-0.0383135	-0.0399661	-0.04011448	-0. 04034145
R-sqr	0.20468	0.20375	0.20413	0.2051
AIC	-574.1613	-571.4616	-573.1109	-572.1932
N	420	420	420	420

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

First regression is the regression for liability dollarization that is used in this study. Second regression has number of employee and cost of production variables instead of profit/loss variable because these variables are highly correlated and cannot be in the same regression together. Similarly, in the third regression revenue variable added and cost of production, profit/loss and number of employee variables leaved out from equation. In the fourth regression all contracting variables other than profit/loss leaved out from regression. Although, regressions have different outcomes and significance levels, public offering year, shares of exports in total sales and tangible asset ratio are statistically significant in all regressions. Main reason why we prefer first regression over other regression is first regression has the lowest AIC value out of all regressions. In addition to that first regression has no strongly correlated variables which makes us enable to continue with other assumptions like stationarity and heteroskedasticity.

CHAPTER 5: CONCLUSION

5.1. Results

The ultimate goal of this study is to exhibit asset and liability dollarization of firms of Borsa Istanbul Metal Products and Machinery Index during Covid-19 Epidemic. In order to fully represent the situation financial statements and financial reports between first quarter of 2018 and second quarter of 2021 of all companies in the index examined comprehensively. Two panel data models formed, one for asset dollarization and one for liability dollarization. Leverage ratio, tangible asset ratio, number of employees variables are statistically significant explaining asset dollarization. In addition to that, public offering year, tangible asset ratio and share of exports in total sales variables are statistically significant explaining liability dollarization.

In the light of results obtained from regression models, it is safe to say tangible asset ratio affect asset and liability dollarization similarly. Both in our regressions, tangible asset ratio and dollarization have an inverse relationship. As it may be more difficult for a creditor to liquidate a tangible asset in order to collect a foreign currency debt, higher tangible asset ratio can be expected to increase the share of local currency debt while reducing the share of foreign currency debt.

Share of exports in total sales and public offering year of companies are only significant explaining liability dollarization, they have no effect to asset dollarization. Share of total exports in total sales and liability dollarization have a positive relationship because firms tend to match their foreign currency debts with exports causing foreign currency levels in liability side of the balance sheet to increase. Companies that went public more recently have less foreign resources because they have less liquidity and financing than older companies. In other words, older companies have higher level of   liability dollarization.

On the asset side of the balance sheet, leverage ratio and number of employees variables are statistically significant in asset dollarization regression. A negative leverage ratio coefficient can be interpreted as firms find it more difficult to borrow in foreign currencies, while a positive leverage ratio coefficient indicates that they find it more difficult to borrow in domestic currencies. Leverage ratio has

inverse relationship between asset dollarization meaning firms prefer to borrow in local currency. Though it is small impact, it is possible to observe a positive relationship between asset dollarization and number of employees of companies. In order to pay their employees' salaries, companies that need more resources have chosen to borrow in the short term often in foreign currency. Statistics show that there is not enough evidence to support short term foreign debt ratio, or establishment year have any impact to asset and liability dollarization of XMESY firms.

5.2. Limitations and Implications for Further Research

Main struggle of this study comes from the unavailability of more financial statements and financial reports. Most of the firms that are included in BIST XMESY Index does not have quarterly financial reports or statements before 2018 on KAP's website. It may be more beneficial for future researches to cover a longer time period. It is also should be considered that articles written in other languages rather than Turkish or English about asset or liability dollarization could not be examined therefore, could not be included in this study. This study concentrates metal products and machinery sectors in Borsa Istanbul other sectors could be included and broaden the scope of the study. It is also stated that many variables can affect dollarization. Different variables can be implemented to regressions in order to form different regressions.

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APPENDIX

Appendix A - Asset Dollarization and Liability Dollarization Graphs of Firms

Asset Dollarization illustrated with red line.

Liability Dollarization illustrated with blue line.

Liabilty and Asset Dollarization: ANADOLU ISUZU OTO. SAN. VE TİC. A.Ş.
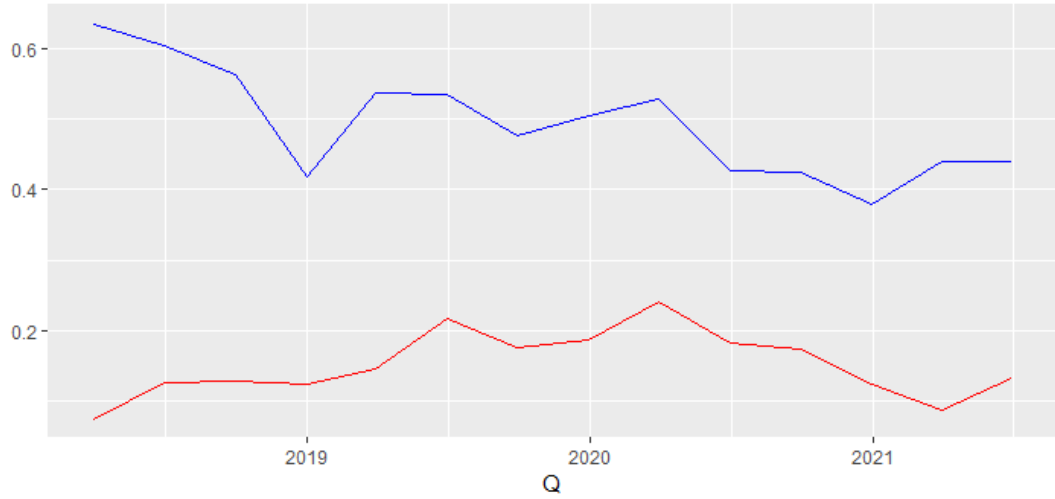
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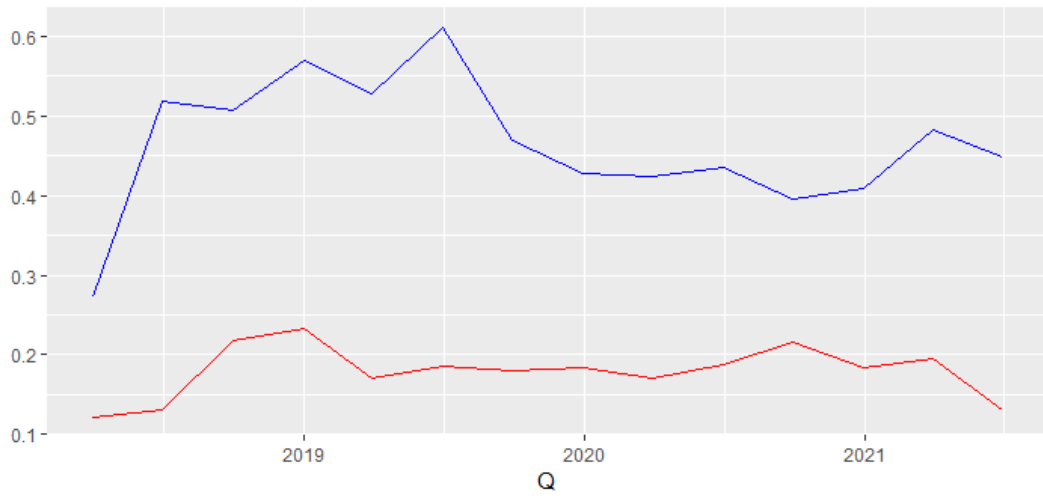
Liabilty and Asset Dollarization: ARÇELİK A.Ş.
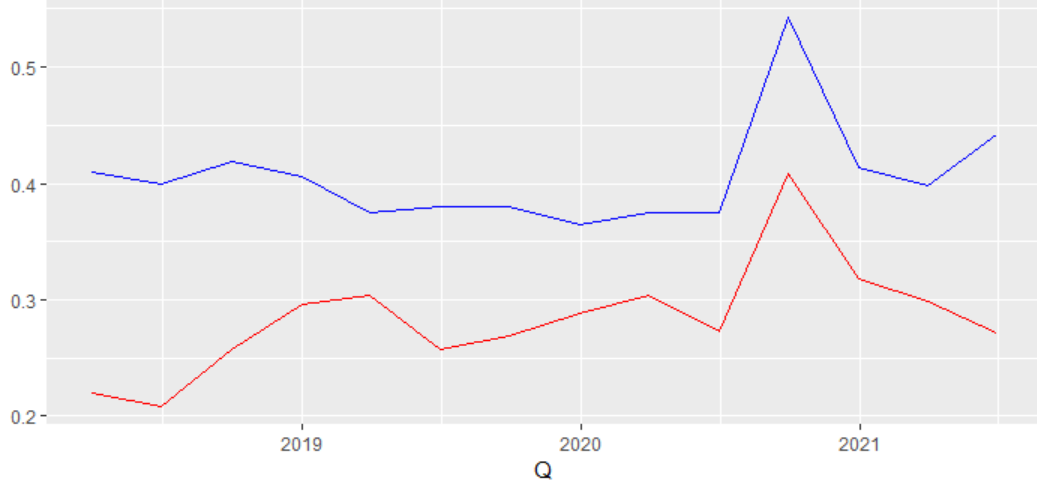
Liabilty and Asset Dollarization: BANTAŞ BANDIRMA AMB. SAN. TİC. A.Ş
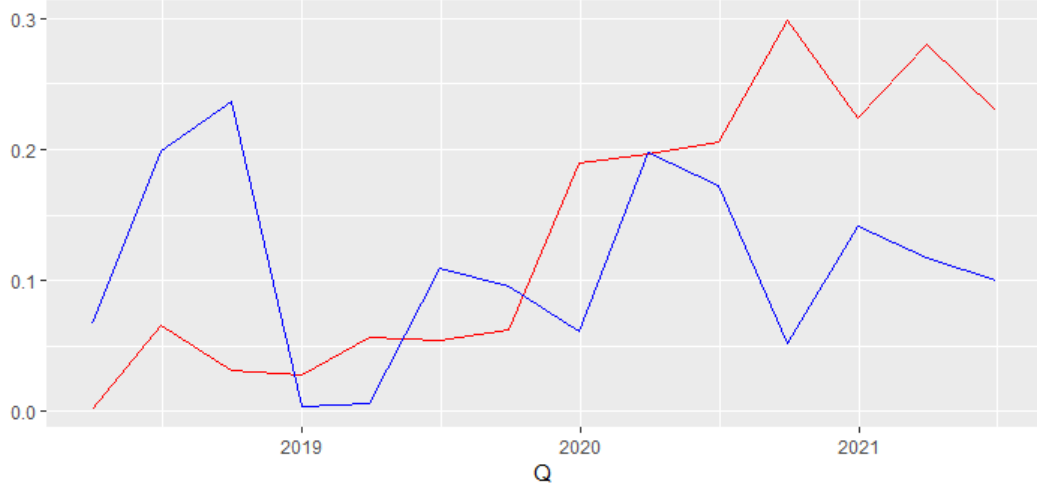
Liabilty and Asset Dollarization: BOSCH FREN SİS. SAN. VE TİC. A.Ş.
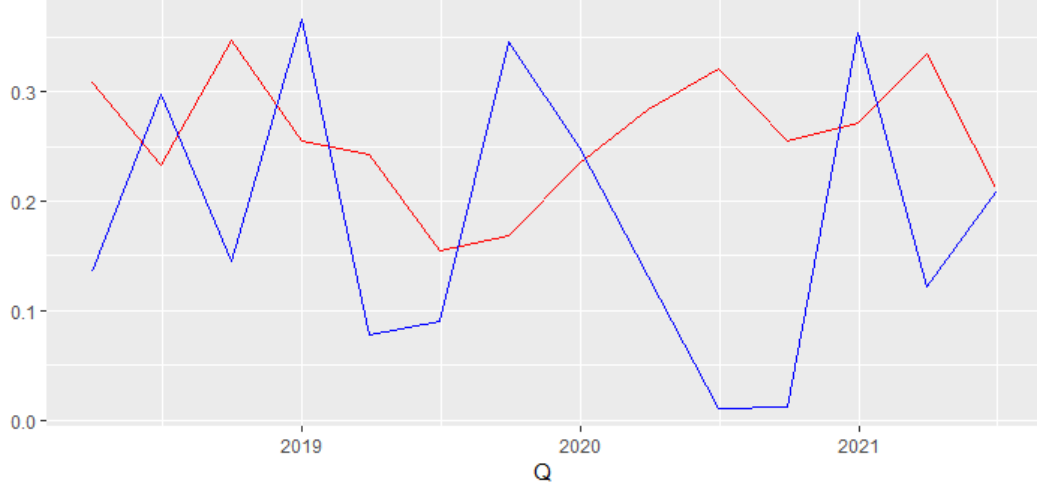
Liabilty and Asset Dollarization: DİTAŞ DOĞAN YED. PAR. İM. VE TEK. A.Ş.
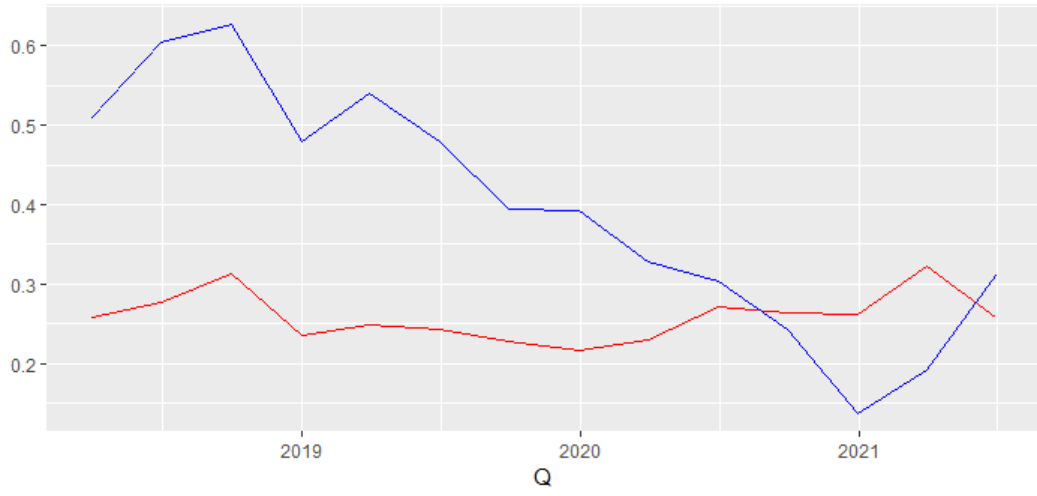
Liabilty and Asset Dollarization: EGE ENDÜSTRİ VE TİCARET A.Ş.
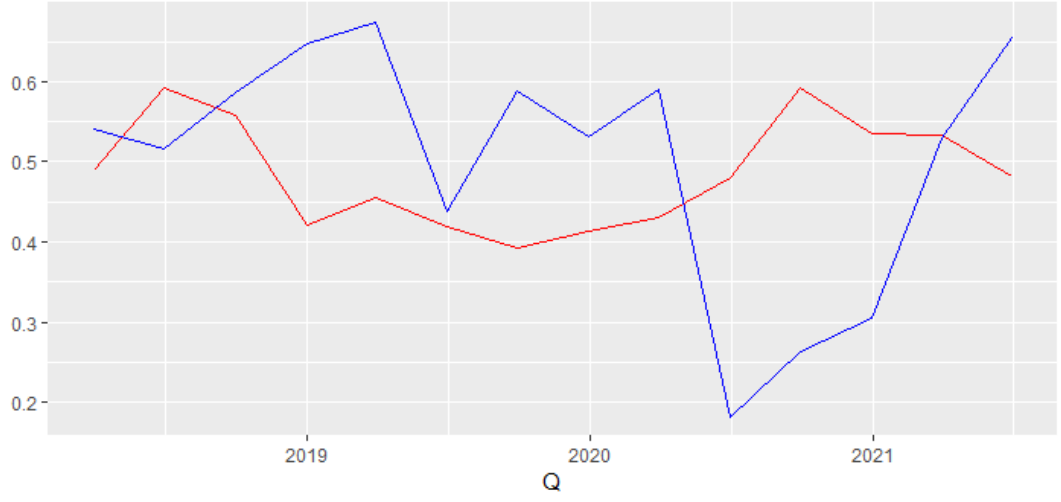
Liabilty and Asset Dollarization: EMEK ELEKTRİK ENDÜSTRİSİ A.Ş.
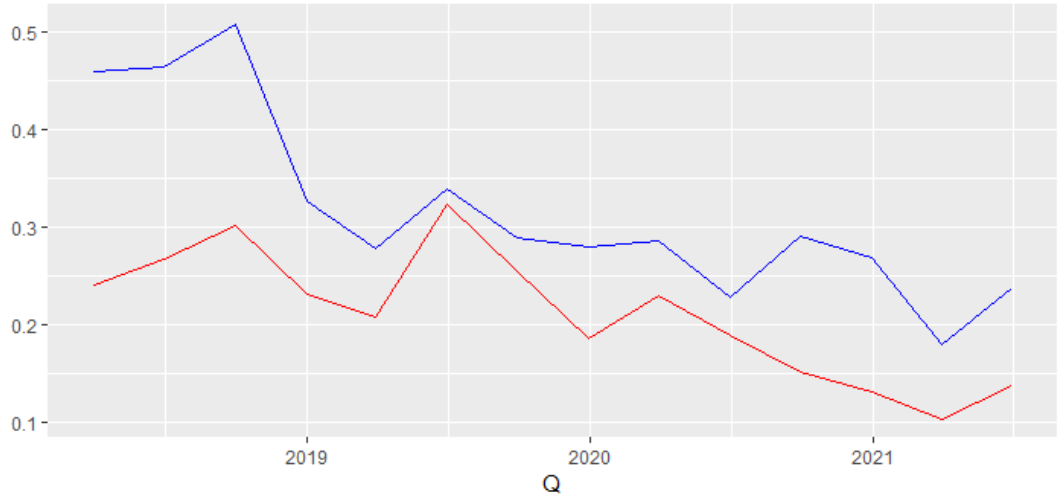
Liabilty and Asset Dollarization: EMİNİŞ AMBALAJ SANAYİ VE TİCARET A.Ş.
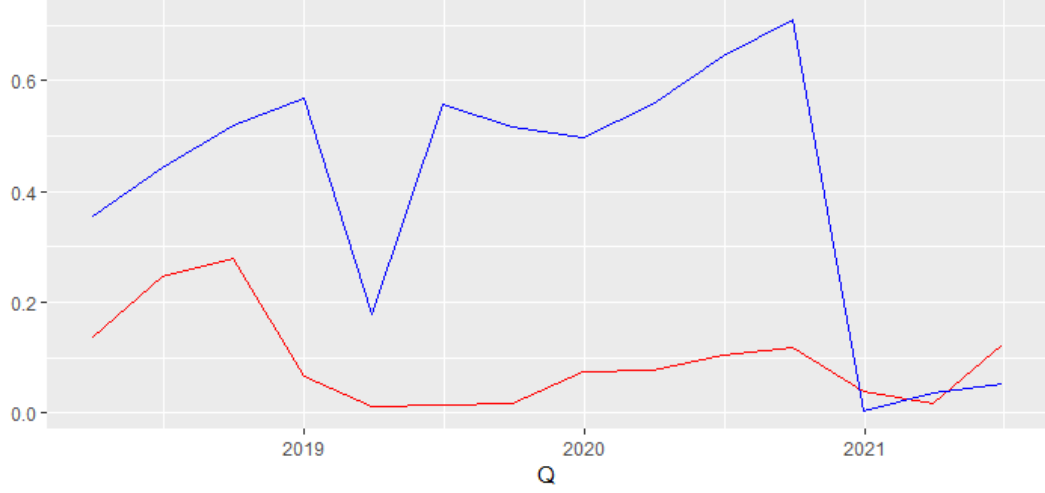
Liabilty and Asset Dollarization: FEDERAL-MOGUL İZM. PİS. VE PİM ÜR. TES. A.Ş.
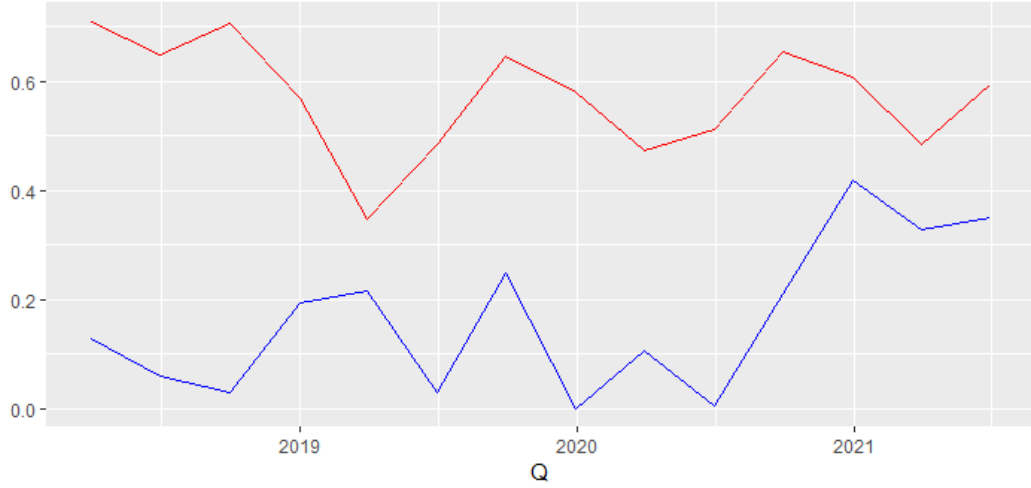
Liabilty and Asset Dollarization: FORD OTOMOTİV SANAYİ A.Ş.
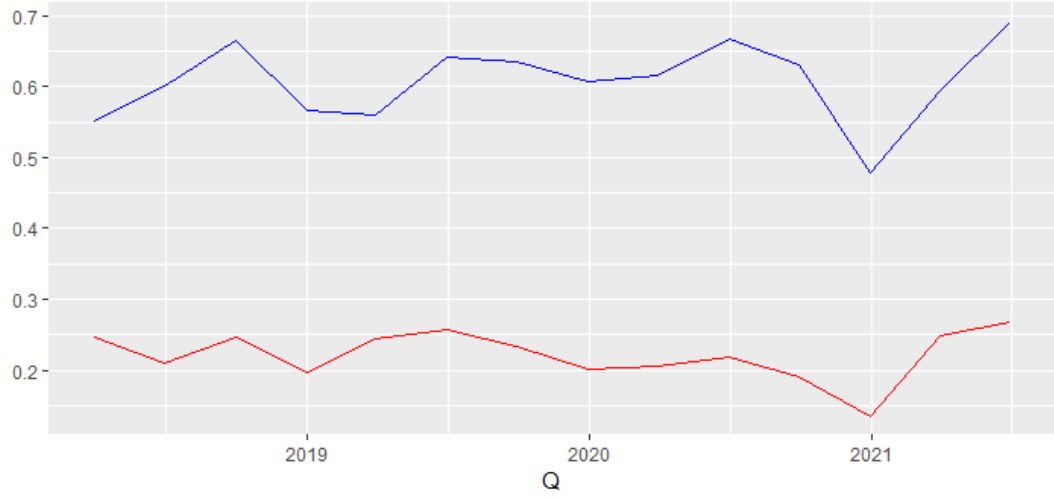
Liabilty and Asset Dollarization: FORMET METAL VE CAM SANAYİ A.Ş.
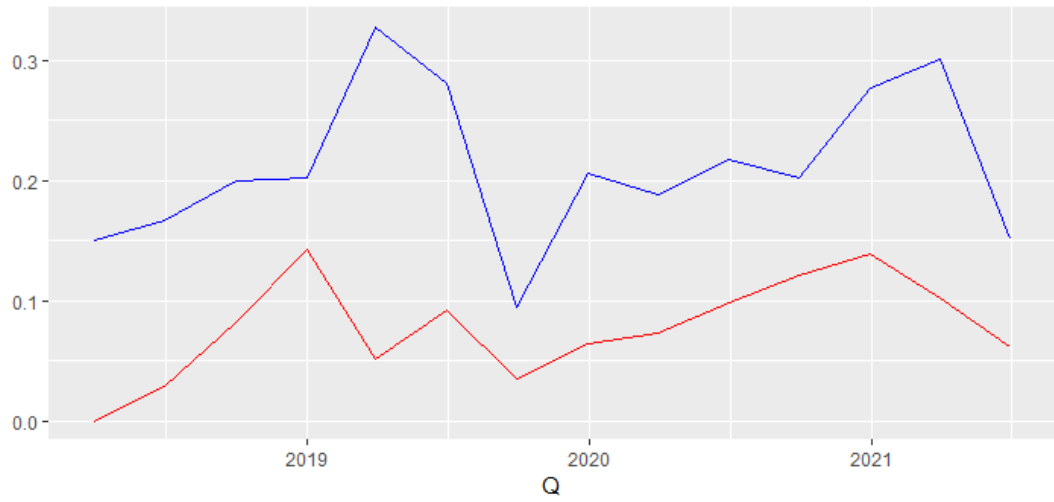
Liabilty and Asset Dollarization: GERSAN ELEKTRİK TİCARET VE SANAYİ A.Ş.
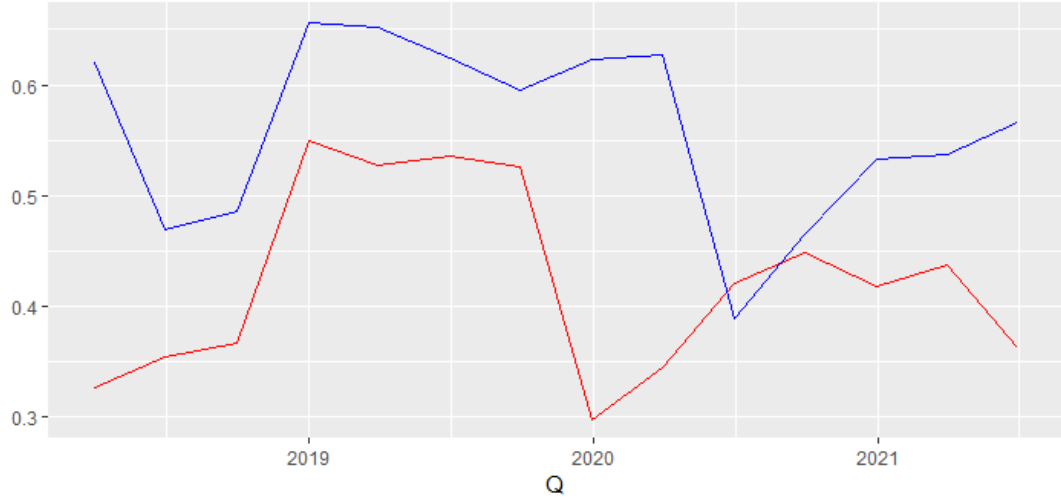
Liabilty and Asset Dollarization: İHLAS EV ALET. İMALAT SAN. VE TİC.A.Ş
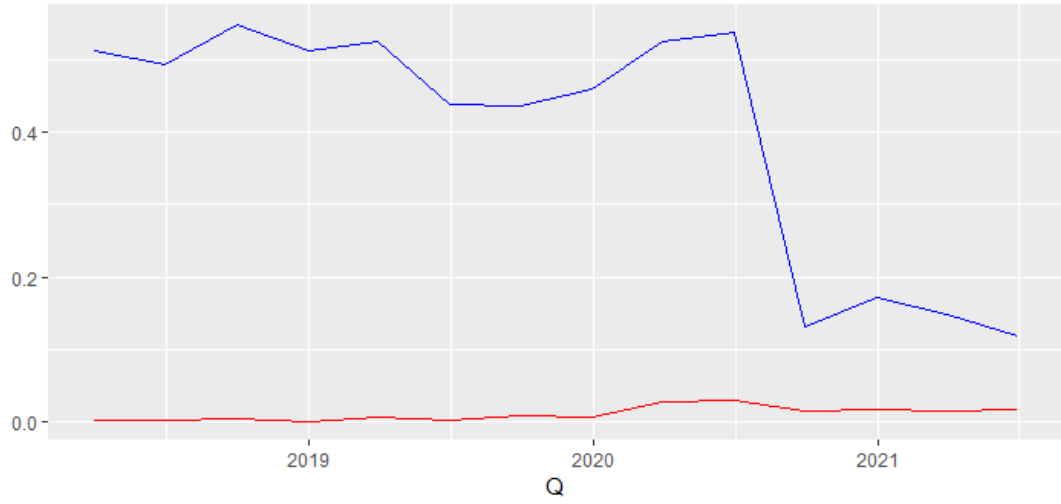
Liabilty and Asset Dollarization: JANTSA JANT SANAYİ VE TİCARET A.Ş.
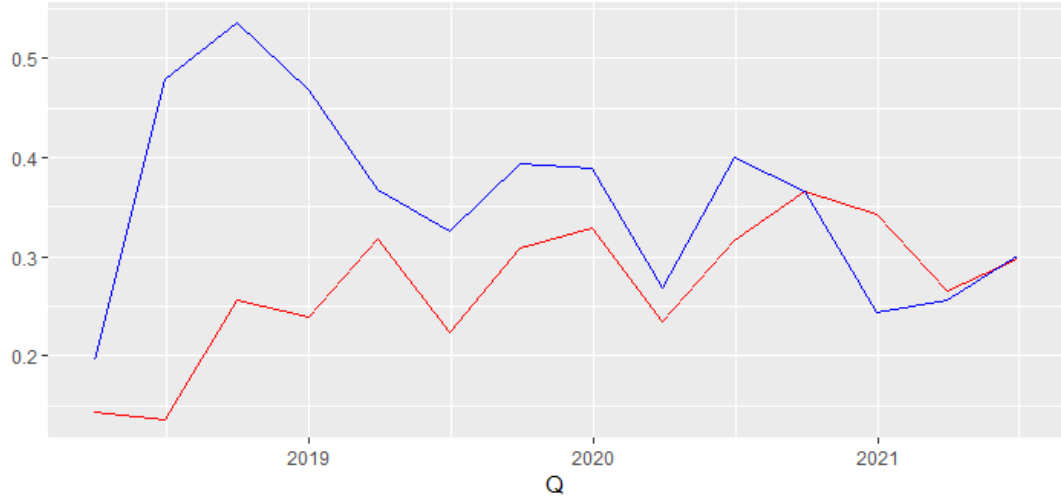
Liabilty and Asset Dollarization: KARSAN OTOMOTİV SANAYİİ VE TİCARET A.Ş.
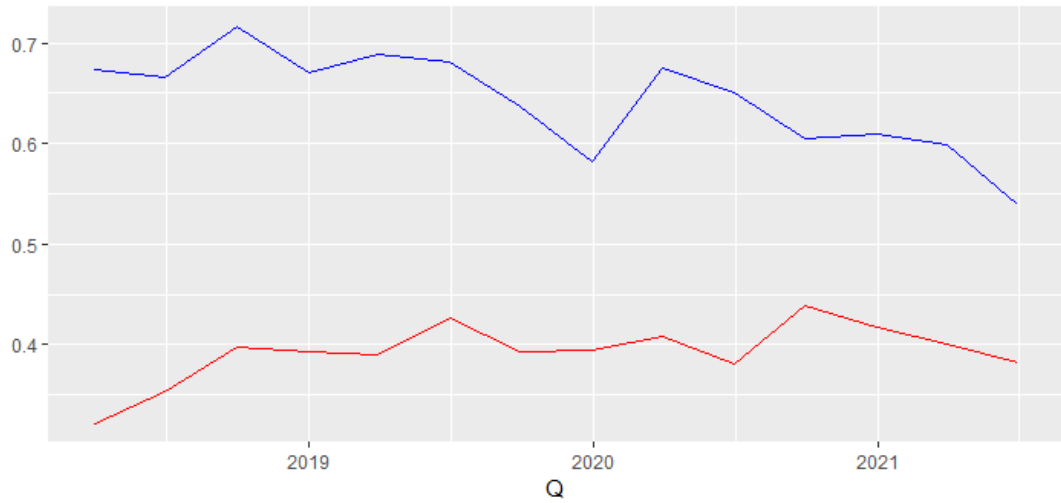
Liabilty and Asset Dollarization: KATMERCİLER ARAÇ ÜSTÜ EKİP. SAN. VE TİC. A.
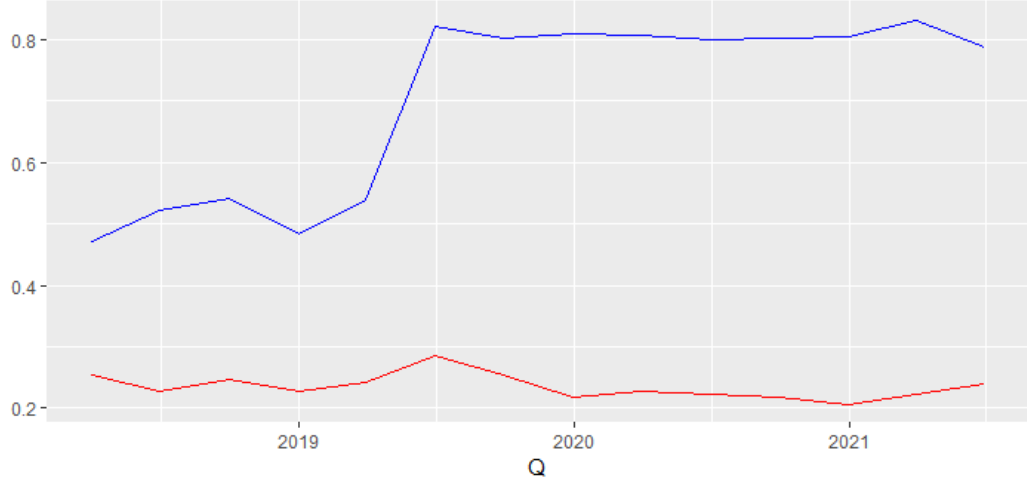
Liabilty and Asset Dollarization: KLİMASAN KLİMA SANAYİ VE TİCARET A.Ş.
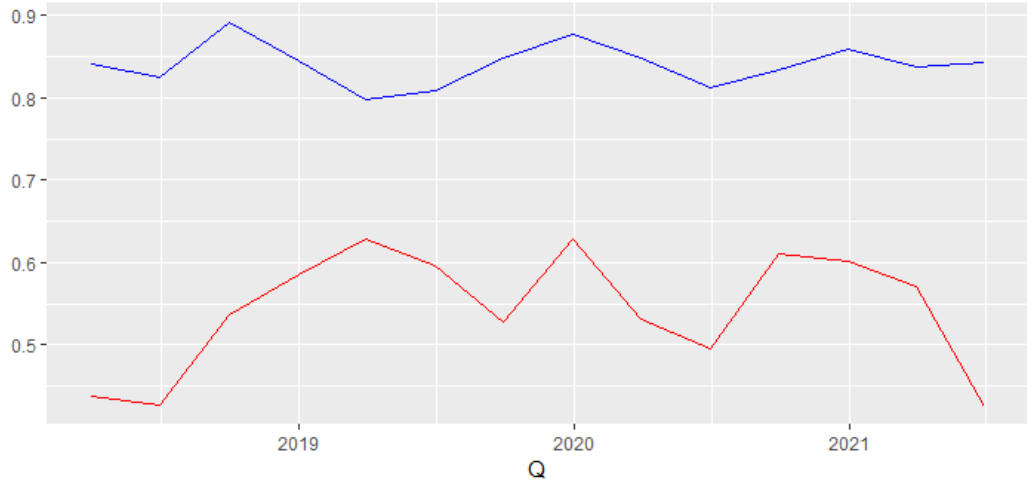
Liabilty and Asset Dollarization: MAKİNA TAKIM ENDÜSTRİSİ A.Ş.
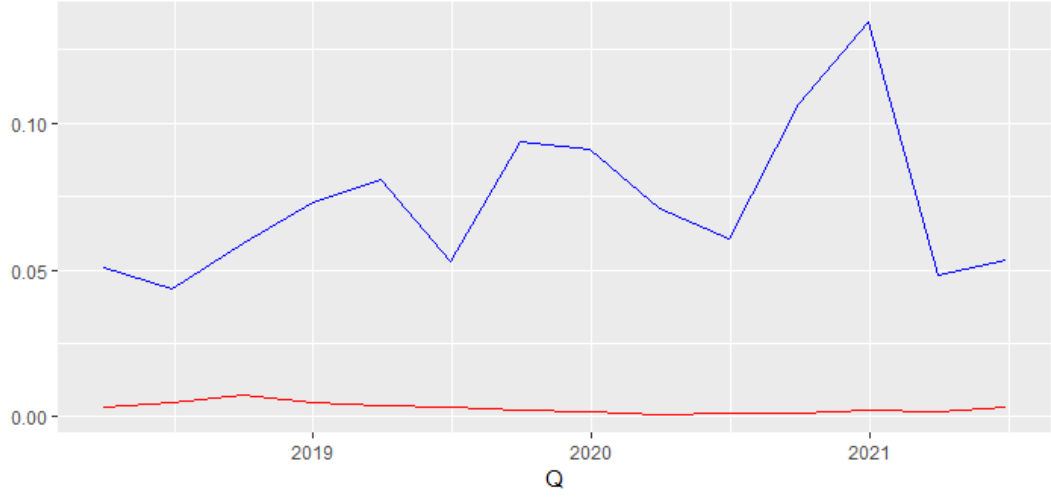
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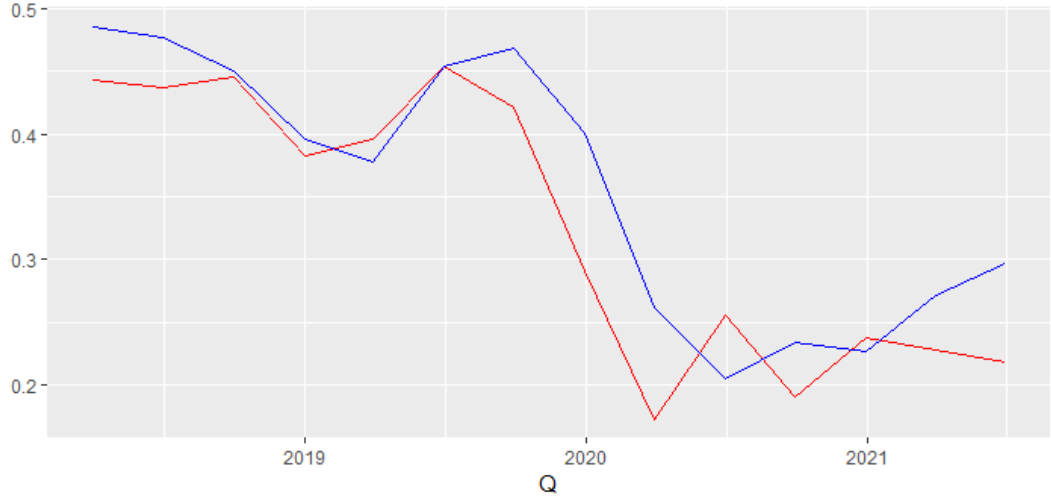
Liabilty and Asset Dollarization: TÜRK PRYSMİAN KABLO VE SİSTEMLERİ A.Ş.
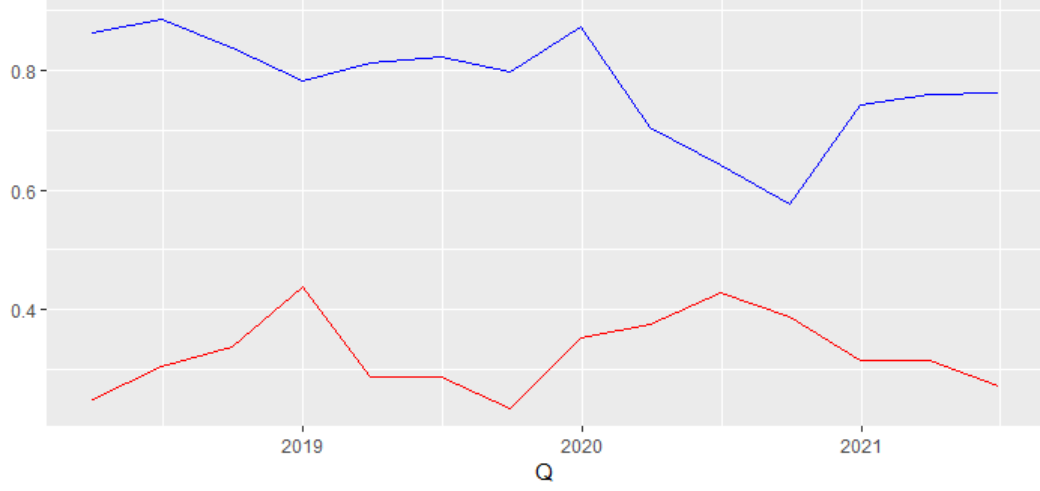
Liabilty and Asset Dollarization: SAY YEN. ENER. EKİP. SANAYİ VE TİCARET A.Ş.
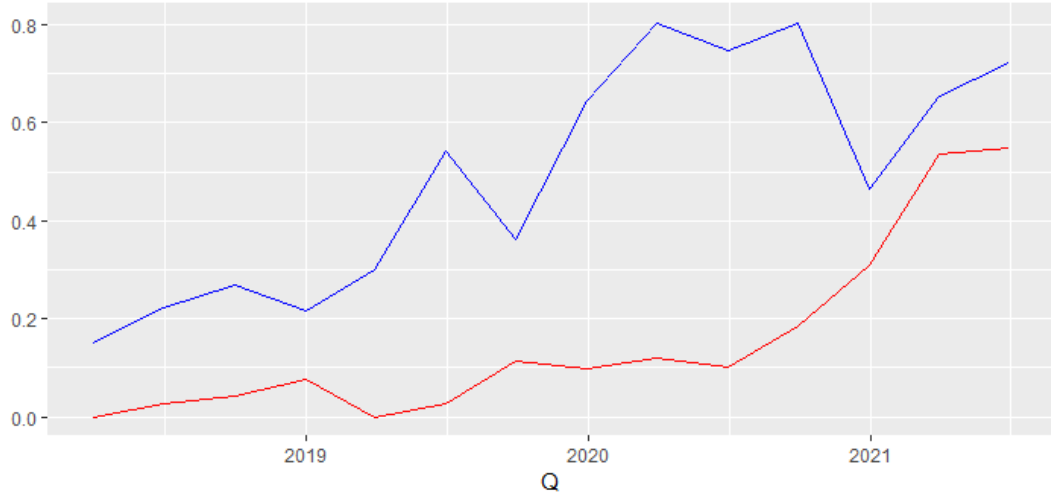
Liabilty and Asset Dollarization: SİLVERLİNE ENDÜSTRİ VE TİCARET A.Ş.
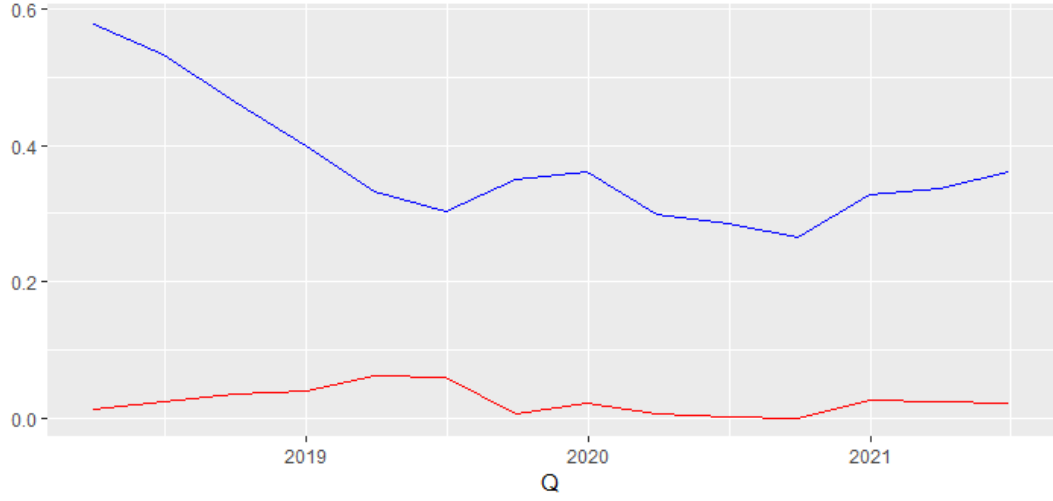
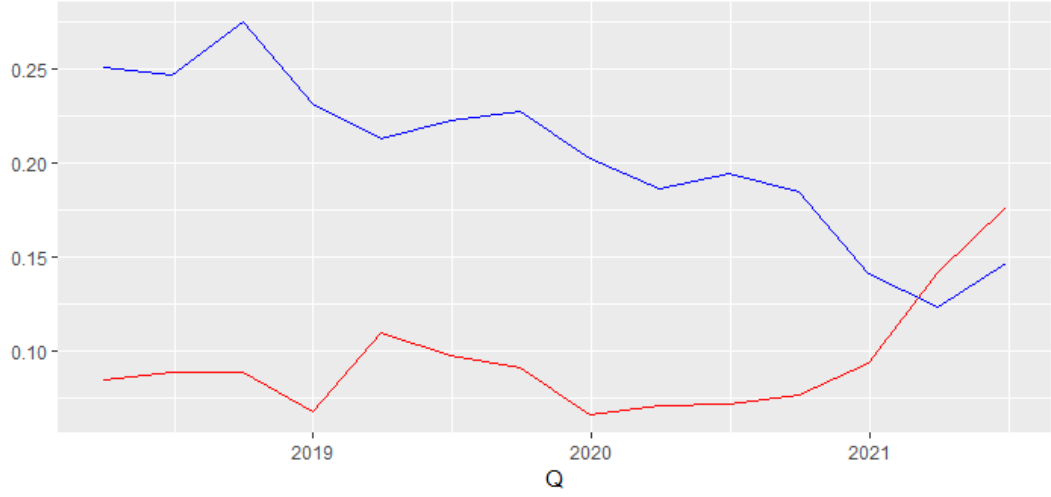Liabilty and Asset Dollarization: TOFAŞ TÜRK OTOMOBİL FABRİKASI A.Ş.
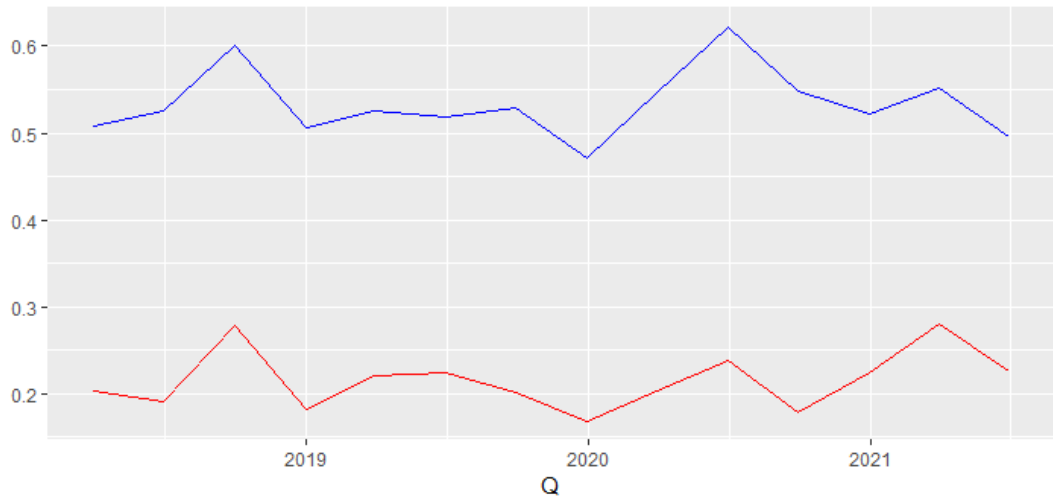
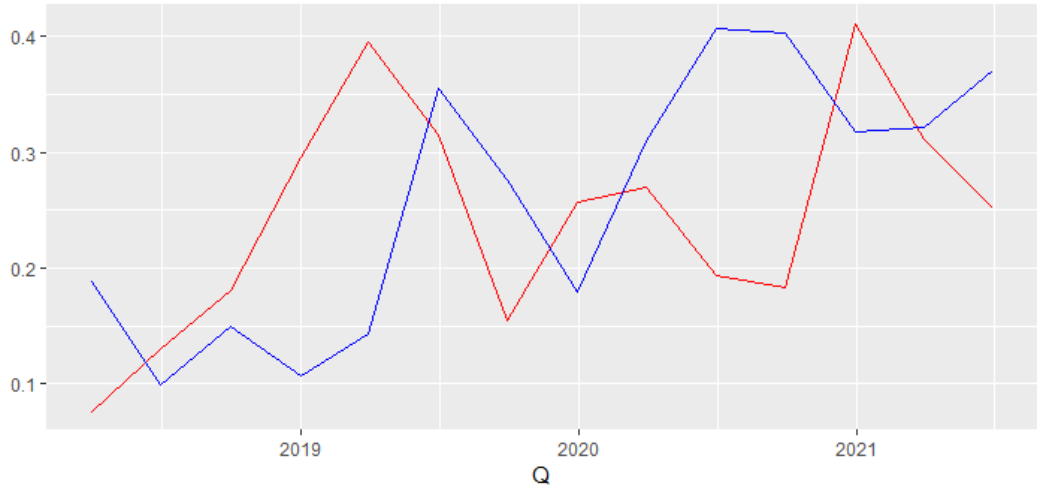Liabilty and Asset Dollarization: TÜMOSAN MOTOR VE TRAKTÖR SANAYİ A.Ş.
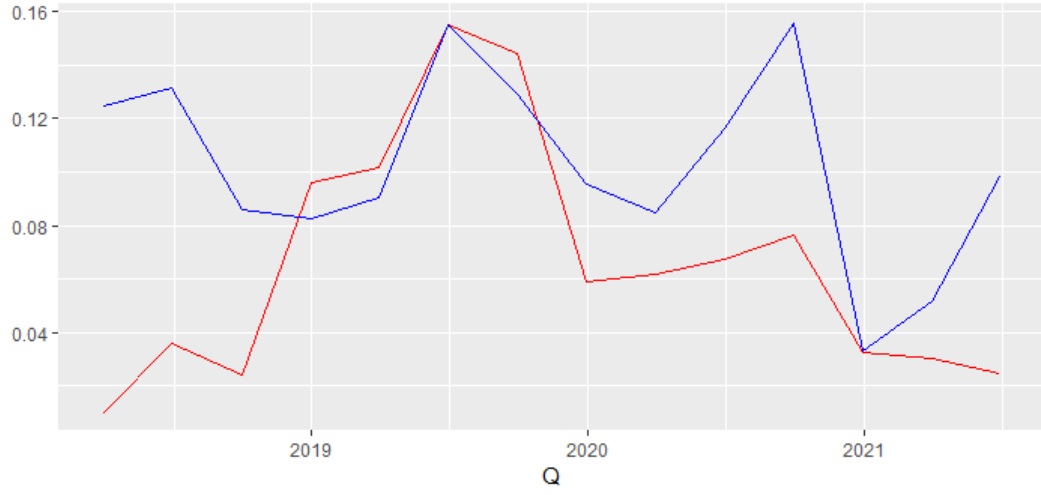
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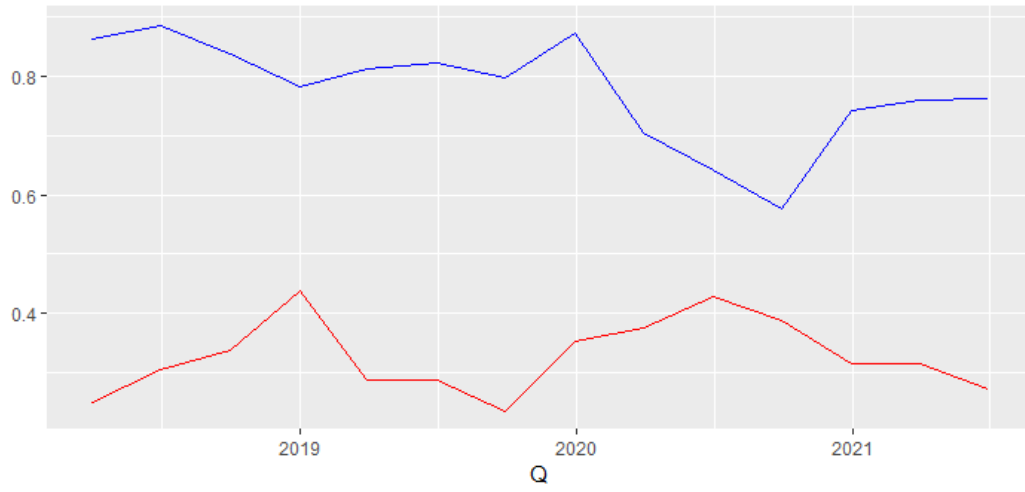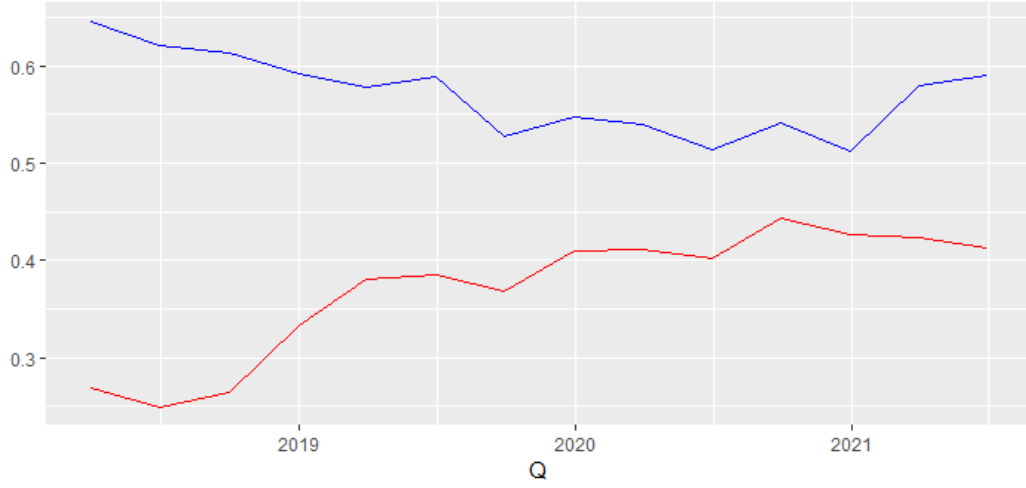
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Liabilty and Asset Dollarization: ULUSOY ELEK. İMALAT TAAHHÜT VE TİCARET A.

Liabilty and Asset Dollarization: VESTEL ELEKTRONİK SANAYİ VE TİCARET A.Ş.

Liabilty and Asset Dollarization: VESTEL BEYAZ EŞYA SANAYİ VE TİCARET A.Ş.