ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL

VALUATION OF HOLDING COMPANIES LISTED ON BORSA ISTANBUL

M.Sc. THESIS

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Department of Management

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JANUARY 2023

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To my spouse Görkem and my family,

FOREWORD

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ABBREVIATIONS

A.Ş. : Anonim Şirketi
ACSEL : Acıselsan Acıpayam Selüloz Sanayi ve Ticaret Anonim Şirketi
ADEL : Adel Kalemcilik Ticaret ve Sanayi Anonim Şirketi
ADESE : Adese Gayrimenkul Yatırım Anonim Şirketi
AEFES : Anadolu Efes Biracılık ve Malt Sanayi Anonim Şirketi
AGHOL : AG Anadolu Grubu Holding
AKBNK : Akbank Türk Anonim Şirketi
AKCNS : Akçansa Çimento Sanayi ve Ticaret Anonim Şirketi
AKGMY : Akmerkez Gayrimenkul Yatırım Ortaklığı Anonim Şirketi
AKGRT : Aksigorta Anonim Şirketi
ALARK : Alarko Holding Anonim Şirketi
ALCAR : Alarko Carrier Sanayi ve Ticaret Anonim Şirketi
ALGYO : Alarko Gayrimenkul Yatırım Ortaklığı Anonim Şirketi
AP : Account Payables
AR : Account Receivables
ARCLK : Arçelik Anonim Şirketi
ASUZU : Anadolu Isuzu Otomotiv Sanayi ve Ticaret Anonim Şirketi
avg : Arithmetic average
AVISA : Agesa Hayat ve Emeklilik Anonim Şirketi
AYGZ : Aygaz Anonim Şirketi
BIST : Borsa Istanbul Stock Exchange Market
BRISA : Brisa Bridgestone Sabancı Lastik Sanayi ve Ticaret Anonim Şirketi
BV : Book Value
CapEx : Capital Expenditure
CAPM : Capital Asset Pricing Model
CCOLA : Coca-Cola İçecek Anonim Şirketi
CEEMEA : Central and Eastern Europe, the Middle East and Africa
CELHA : Çelik Halat ve Tel Sanayi Anonim Şirketi
CEMAS : Çemaş Döküm Sanayi Anonim Şirketi
CIMSA : Çimsa Çimento Sanayi ve Ticaret Anonim Şirketi

COGS : Cost of Goods Sold

CRFSA : Carrefour Sabancı Ticaret Merkezi Anonim Şirketi

D&A : Depreciation and Amortization

DCF : Discounted Cash Flow

DDM : Dividend Discount Model

DITAS : Ditaş Doğan Yedek Parça İmalat ve Teknik Anonim Şirketi

DOBUR : Doğan Burda Dergi Yayıncılık ve Pazarlama Anonim Şirketi

DOHOL : Doğan Şirketler Grubu Holding Anonim Şirketi

EBIT : Earnings Before Interest and Tax

ECILC : Eis Eczacıbaşı İlaç, Sınai ve Finansal Yatırımlar Sanayi ve Ticaret Anonim Şirketi

ECZYT : Eczacıbaşı Yatırım Holding

EPLAS : Egeplast Ege Plastik Ticaret ve Sanayi Anonim Şirketi

ERM : Excess Return Model

EU : European Union

FCFE : Free Cash Flow to Equity

FCFF : Free Cash Flow to Firm

FROTO : Ford Otosan

G&A : General and Administrative Expenses

GDP : Gross Domestic Product

GLBMD : Global Menkul Değerler Anonim Şirketi

GLYHO : Global Yatırım Holding Anonim Şirketi

GSDDE : GSD Denizcilik Gayrimenkul İnşaat Sanayi ve Ticaret Anonim Şirketi

GSDHO : GSD Holding Anonim Şirketi

IEYHO : Işıklar Enerji ve Yapı Holding Anonim Şirketi

IHEVA : İhlas Ev Aletleri İmalat Sanayi ve Ticaret Anonim Şirketi

IHGLM : İhlas Gayrimenkul Proje Gelistirme ve Ticaret Anonim Şirketi

IHGZT : İhlas Gazetecilik Anonim Şirketi

IHLAS : İhlas Holding Anonim Şirketi

IHYAY : İhlas Yayın Holding Anonim Şirketi

INTEM : İntema İnşaat ve Tesisat Malzemeleri Yatırım ve Pazarlama Anonim Şirketi

INV : Inventory

ITTFH : İttifak Holding Anonim Şirketi

KCHOL : Koç Holding

KORDS : Kordsa Teknik Tekstil Anonim Şirketi

MAALT : Marmaris Altınyunus

max : Maximum

MEPET : Mepet Metro Petrol ve Tesisleri Sanayi Ticaret Anonim Şirketi

MERIT : Merit Turizm Yatırım ve İşletme Anonim Şirketi

METRO : Metro Holding Anonim Şirketi

MGROS : Migros Ticaret Anonim Şirketi

min : Minimum

MIPAZ : Milpa Ticari ve Sinai Urunler Pazarlama Sanayi ve Ticaret Anonim Şirketi

MRP : Market Risk Premium

MZHLD : Mazhar Zorlu Holding

NACE : The Statistical Classification of Economic Activities in the European Community

NIBAS : Niğbaş Niğde Beton Sanayi ve Ticaret Anonim Şirketi

NTHOL : Net Holding Anonim Şirketi

NWC : Net Working Capital

OECD : Organization for Economic Co-operation and Development

OTKAR : Otokar Otomotiv ve Savunma Sanayi Anonim Şirketi

P&L : Profit and Loss Financial Statement

PDP : Public Disclosure Platform

PE : Price Earnings

PEGYO : Pera Gayrimenkul Yatırım Ortaklığı Anonim Şirketi

PPE : Plant, Property and Equipment

PV : Present Value

R&D : Research and Development Expenses

RE : Retained Earnings

ROE : Return on Equity

ROIC : Return on Invested Capital

S&M : Sales and Marketing

SAHOL : Sabancı Holding

SOTP : Sum of the Parts

Std. Dev. : Standard Deviation

TATGD : Tat Gıda Anonim Şirketi

The US : the United States

TKFEN : Tekfen Holding Anonim Şirketi

TKNSA : Teknosa İç ve Dış Ticaret Anonim Şirketi

TOASO : Tofaş Türk Otomotiv Fabrikası
TRY : Turkish Lira
TSKB : Turkiye Sınai Kalkınma Bankası Anonim Şirketi
TTRAK : Türk Traktör ve Ziraat Makineleri Anonim Şirketi
TUPRS : Türkiye Petrol Rafineleri Tüpraş
TURCS : Turcas Petrol Anonim Şirketi
TV : Terminal Value
USD : United States Dollar
VANGD : Vanet Gıda Sanayi İç Ve Dış Ticaret Anonim Şirketi
VERTU : Verusaturk Girişim Sermayesi Yatırım Ortaklığı Anonim Şirketi
VERUS : Verusa Holding Anonim Şirketi
WACC : Weighted Average Cost of Capital
WC : Working Capital
XHOLD : BIST Holding & Investments Index
YKBNK : Yapı ve Kredi Bankası
YKGYO : Koray Gayrimenkul Yatırım Ortaklığı Anonim Şirketi

SYMBOLS

D_t	: Dividend received in the specified period
FCF_i, FCF_n	: Free cash flow at specific period
g_c	: Constant growth rate
k_d	: Cost of debt
k_e	: Cost of equity
r_e	: Return on equity
r_f	: Risk-free rate
r_i, r_n	: Discount rate at specific period
r_m	: Return on overall stock market
r_s	: Return on the stock of a company
w_e	: Weight of equity
w_d	: Weight of debt
Δ	: Change
ΔWC	: Change in working capital
T	: Tax rate
V	: Value
$cov(r_s, r_m)$	: Covariance between excess return on stock of a company and a market return
g	: Growth rate
i, n, t	: Specified period
$var(r_m)$	: Variance of excess return on the overall stock market
β	: Beta

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VALUATION OF HOLDING COMPANIES LISTED ON BORSA ISTANBUL

SUMMARY

Businesses have been growing and expanding their scope and territories of operations in response to the development of the products and services markets as a result of globalization. Therefore, organisations must adapt to the changes in order to maintain continuity and gain a competitive edge. Numerous regional, national, and international economic agreements as well as capital groupings were established as a result of these modifications. Holding corporations are one type of commercial arrangement between businesses. These organizations and their subsidiaries are very important for not only the global economy and stock markets, but also the Turkish economy and the Borsa Istanbul (BIST), where firms are listed in Turkiye. Consequently, given the significance of holding companies, computing fair values of these organizations is essential for investors, business owners, management team and other stakeholders.

According to several studies, holding companies that are listed on stock exchange platforms throughout the world are traded with discount, which has different rates in different markets. For instance, the holdings in the United States of America (USA) are discounted between 10-15% whereas, the ratios in South Korea are between 30-60%. However, there is relatively few studies in the literature on the value of holding corporations in Turkiye. My goal for this thesis is to add to the literature by methodically valuing holding businesses in Turkey. In addition, I would like to provide scholars and investors an approach that is both statistically and practically useful. In this thesis, I studied on the holding firms, which met particular requirements, and their subsidiaries to understand whether holding companies listed on BIST are valued with discount, and if so, in which discount rate. The Sum of The Parts (SOTP) approach is used in this study to determine the valuations of holding corporations that meet several criteria and are listed on BIST. To uncover the answers to my research questions, then I compared the results with actual stock prices at the end of 2020.

In the basis of SOTP method, a holding's value is calculated by its subsidiaries. The first approach applied according to this methodology is to multiply the determined fair value of each subsidiary by the holding company's ownership ratio and sum the values. The fair value of one share is then calculated by dividing the figure by the total number of outstanding shares. The overall value of non-public subsidiaries is considered to be proportionately equal to the computed value of public subsidiaries. Therefore, a crucial financial indicator is used to compute the ratio of public and non-public subsidiaries. Since the fair value of each share of the holding estimated by its publicly listed subsidiaries is known, the overall value of the holding is determined by multiplying the value of its publicly traded affiliates by the holding company as a whole.

As a first step, the valuation method of the subsidiaries is determined. Mainly, holding companies have two types of subsidiaries: manufacturing firms and financial service firms. In the literature and practice, there are many different valuation methods, which enable to calculate fair value of any stock, and each of them have several advantages

and disadvantages. One of the main methods is Discounted Cash Flow (DCF) and it has three breakdowns: Free Cash Flow to Firm (FCFF), Free Cash Flow to Equity (FCFE), Dividend Discount Model. Moreover, relative valuation and Excess Return Model (ERM) are other valuation methods. As per recommendations in the literature and considering the beneficial of the method, FCFF is applied to assess the fair value of manufacturing firms and ERM is applied to assess the fair value of financial service firms. The two main reasons why two different methods are applied for valuation are based on the different financial structure and the applied regulations.

The second step of the thesis is determining the holding companies which fit several criteria. Considering the logic of SOTP, holding companies should have at least one publicly traded subsidiary, and the weight of the subsidiary or subsidiaries in the holding should reflect the holding's selected financial indicator, which is stakeholders' equity value, proportionally. Moreover, holding companies should be listed on BIST for at least three years, ideally at least five years. Although seventeen holding companies listed on Holdings & Investment Index (XHOLD), only five holding companies meet the criteria and so, these are valued. Totally, the five holding companies, which are Koç Holding (KCHOL), Sabancı Holding (SAHOL), and AG Anadolu Grubu Holding (AGHOL), Mazhar Zorlu Holding (MZHLD), and Eczacıbaşı Yatırım Holding (ECZYT), consist of 67% of XHOLD.

In the third step, the subsidiaries of these five holding companies are calculated with either FCFF or ERM. Then, the holdings fair values are calculated by SOTP. As a result, it is found that the discount rate for KCHOL is %70, the rate for SAHOL is 86% and the rate for AGHOL is 81%. These three holdings consist of 64.18% of XHOLD at the end of 2020. Moreover, ECZYT is discounted by 15% and MZHLD is discounted by 37%. Consequently, this thesis demonstrates that holding firms in Turkiye are discounted between 15% and 86% when the holding values are derived from the valuation of their subsidiaries. These results belong to 2020 and to understand the existence of discount for different years, second approach is applied.

According to the second approach, SOTP is used to calculate the holdings' values but instead of computing fair values of the subsidiaries, the market values are considered. Therefore, fair values of seventeen holding companies are calculated between 2011 and 2020 in this approach by using market value of their subsidiaries. As a result, in most cases, holdings are traded with discount either certain years or fully except one holding. As a result of the second approach, KCHOL is traded with discount by 62%, the rate for SAHOL is 71% and for AGHOL is 76%. Also, ECZYT is discounted as 14% and the rate for MZHLD is the same as the previous one, 55%. When the fair values of the holding companies are computed by using the market values of their subsidiaries, 67% of the index is traded with discount between 14% and 76%.

The findings from both approaches are compared with the market values in 2020 since three values are available. In both cases, holding companies in Turkiye are traded with discount on the stock exchange market. However, the range of the rate is wider when market values are taken. These results indicate that holding companies listed on BIST has similar discount rate to Korean holding companies rather than the USA.

BORSA İSTANBUL'DA YER ALAN HOLDİNGLERİN DEĞERLEMESİ

ÖZET

Küreselleşmeyle birlikte ürün ve hizmet pazarları gelişmiş, buna bağlı olarak organizasyonlar büyüyerek faaliyet alanlarını genişletmişlerdir. Süreklilik sağlamak ve rekabet avantajı elde etmek isteyen işletmeler, yaşanan değişimlere uyum sağlamak zorundadırlar. Tüm bu değişimlerin ve adaptasyonun bir sonucu olarak çok sayıda bölgesel, ulusal ve uluslararası ekonomik anlaşmalar ve sermaye grupları oluşturulmuştur. Holding şirketleri de bu şekilde doğan, işletmeler arasındaki bir tür ticari anlaşmadır. Holdingler, temel olarak ticari faaliyette bulunmayan ve sahip olduğu iştiraklerin ve bağlı ortaklıkların yönetimine katılan organizasyonlar olarak tanımlanmaktadır. Günümüzde gerek dünya ekonomisinde ve borsalarda, gerekse Türkiye'de ve Borsa İstanbul (BIST)'te önemli rol oynamaktadır. Dolayısıyla holding şirketlerinin yeri göz önüne alındığında, sadece yatırımcılar için değil, işletme sahipleri, yönetim kadrosu ve diğer tüm paydaşlar için de bu organizasyonların adil değerlerinin hesaplanması önemlidir.

Literatürde holdinglerin değerlemesine ilişkin bilgi kısıtlı olmakla birlikte, çeşitli çalışmalar göstermektedir ki, holdingler adil değerlerinin altındaki fiyatlarla, yani iskontolu olarak işlem görmektedirler. Araştırmalara göre dünyadaki farklı borsa platformlarında yer alan holdingler, farklı iskontolarla işlem görmektedirler. Örneğin Amerika Birleşik Devletleri borsalarında yer alan holding hisseleri %10-15 arasında iskontoyla işlem görürken, bu oran Güney Kore borsalarındaki %30-60 arasındadır. Öte yandan, literatürde Türkiye'de holding şirketlerinin değerine ilişkin nispeten az sayıda çalışma bulunmaktadır. Bu tezde, Borsa İstanbul'da işlem gören holdinglerin iskontolu değerlenip değerlenmediği, varsa hangi iskonto oranıyla değerlendiğini anlamak için belirli şartları sağlayan holdingler ve bağlı ortaklıkları üzerinde çalıştım. Bu sayede, kısıtlı sayıda araştırma yapılan bu konuda literature katkı sağlamayı amaçladım. Ek olarak, bu çalışmanın araştırmacılara, yatırımcılara, şirket yöneticilerine ve diğer tüm paydaşlara hem teorik hem de pratik olarak faydalı olacağını umuyorum. Tezde, çeşitli kriterleri karşılayan ve BIST'te işlem gören holdinglerin değerlemelerinin belirlenmesi için Parçaların Toplamı (SOTP) methodunu uyguladım ve araştırma sorularımın yanıtlarını bulmak için elde ettiğim hisse adil değer fiyatlarını 2020 yılı sonundaki piyasada hisse senedi fiyatlarıyla karşılaştırdım. Bunun sonucunda da değerlemesi yapılan holdinler için iskonto oranını hesapladım. Ayrıca, iştiraklerin işlem değerleri kullanılarak holdinglerin 2011 ve 2020 arasındaki değerleri SOTP ile hesaplanmıştır. Yine bulunan değerler 2020 yılı sonundaki piyasa değerleriyle ve ilk yöntem ile elde edilen değerlerle karşılaştırılmıştır. Buna göre, iki farklı iştirak değerinden elde edilen iki farklı holding adil değeri ile holdingin işlem değeri olmak üzere toplamda üç değerin karşılaştırılması yapılmıştır.

Tezin ilk aşamasında, literatürde yer alan değerleme yöntemleri avantaj ve dezavantajlarıyla incelenmiştir. Holdingler parçaların toplamı yöntemiyle değerlense de iştiraklerinin değerlenmesi de ilk yönteme göre gerekmektedir. Temel olarak

holding iştirakleri imalat firmaları ve finansal hizmet firmaları olarak ikiye ayrılmaktadır. İncelmesi yapılan değerleme methodlarından ilki İndirgenmiş Nakit Akışı (DCF) methodudur. Bu methodun üç alt kırılımı söz konusu olup bunlar, Firmaya Serbest Nakit Akışı (FCFF), Öz Sermayeye Serbest Nakit Akışı (FCFE) ve Temettü İndirim Modelidir (DDM). Ayrıca, göreceli değerleme method ve Fazla Getiri Modeli (ERM) de incelemesi yapılan diğer değerleme methodlarıdır. Her bir method için avantaj ve dezavantajları, uygulama yöntemleri ve formulleri, gerekli veriler belirtilmiştir. Methodların pratik uygulamaları, örnek çalışmalar ve yapılan araştırmalar göz önünde bulundurulduğunda, firmaya serbest nakit akış methodu imalat firmalarına, fazla getiri modeli ise finansal hizmet firmalarına uygulanmıştır. Bu iki tip firma için farklı değerleme methodlarının uygulanmasının sebeplerinden ilki, finansal hizmet firmalarının finansal yapılarının imalat firmalarından farklı olması, diğer sebep ise bu firmaların farklı regülasyonlara tabi olmasıdır.

Tezin ikinci aşamasında, holdinglerin değerlemesinin yapılması için daha önce bahsi geçen kriterlerin tanımlanması ve bu kriterlere uygun olan holdinglerin belirlenmesidir. Parçaların toplamı methodu, holdingin değerinin iştiraklerinden hesaplanmasına dayanmaktadır. Buna göre, holding şirketlerinin halka açık en az bir iştiraki olmalıdır. Ayrıca, ilk yönteme göre halka açık iştirakler, holding temsil edecek oranda olmalıdır. Bu çalışmada, temsil oranlarının hesaplanması için özkaynaklar bilanço kalemi kullanılmıştır. Ek olarak, holdinglerin borsada en az üç yıl, ideal olarak ise beş yıl süreyle işlem görmesi kriteri de göz önünde bulundurulmuştur. Bu kriterlerin altında yatan sebep, halka açık olmayan holdinglerin veya iştiraklerinin finansal bilgilerine erişimin olmaması, dolayısıyla değerleme aşamasında kullanılamamasından kaynaklanmaktadır.

Borsa İstanbul Holding ve Yatırım endeksinde (XHOLD) toplam otuz yedi holding yer almaktadır. Bu holdinglerin on dokuzunun 2020 yıl sonunda iştiraklerinin hiçbiri borsada işlem görmediği için incelenmeye uygun değildir. Ek olarak, Euro Yatırım Holding A.Ş. (EUHOL) ise 2016 ve 2018 yılları arasında Sermaye Piyasası Kurumu'na halka arz durdurma bavurusunda bulduğu için değerlendirmeye alınmamıştır. Kalan on yedi holding, belirlenen kriterleri karşılamaktadır ve ikinci yönteme göre, piyasa değerleri baz alınarak SOTP'ye göre holdinglerin değeri 2011 ve 2020 yılları için bulunmuştur. Fakat iştiraklerinin yeniden değerlemesinin gerekli olduğu ilk yöntem için ek kriter belirlenmiştir. Bu aşamada, hangi firmaların değerlemesinin yapılacağının bulunması için, iştiraklerin holding temsil payları hesaplanmıştır. Ayrıca, holdinglerin endeksin içindeki yüzdeleri de hesaplanmıştır. Yapılan çalışmaya göre, sadece altı holdingin iştirakleri holding özkaynaklar değerini yüzde kırk ve üzeri oranda temsil etmektedir. Bu holdinglerden bir olan İhlas Yayın Holding A.Ş.(IHYAY)'ın halka açık tek iştiraki İhlas Gazetecilik A.Ş. (IHGZT)'nin geçmiş dönem serbest nakit akım değerinin negatif olması, ayrıca bu holdingin endeksin yalnızca 0.75%'ini oluşturmasından dolayı incelemeye dahil edilmemiştir. Buna göre, Koç Holding A.Ş. (KCHOL), Sabancı Holding A.Ş. (SAHOL), AG Anadolu Grubu Holding A.Ş. (AGHOL), Eczacıbaşı Yatırım Holding A.Ş. (ECZYT) ve Mazhar Zorlu Holding A.Ş. (MZHLD) olmak üzere toplam beş holdingin değerlemesi ilk yönteme göre yapılmıştır. Bu holdingler, BIST Holding ve Yatırım endeksinin toplamda %67'sini oluşturmaktadır.

Tezin üçüncü aşamasında, belirlenen beş holdingin bağlı oraklıklarının adil değerlemesi firmaya serbest nakit akım ya da fazla getiri modeliyle yapılmıştır. Firmaya serbest nakit akım yöntemi Koç Holding iştiraklerinden Tofaş Türk Otomotiv Firması A.Ş. (TOASO)'ya uygulanarak, fazla getiri modeli ise Yapı ve Kredi Bankası

A.Ş. (YKBNK)'ye uygulanarak açıklanmıştır. Ardından, holding değerlerinin hesaplanması için parçaların toplamı yöntemi önce Koç Holding A.Ş.'ye ardından ise diğer holdinglere uygulanmıştır. Hesaplama yapılırken, holdingin halka açık olmayan iştiraklerinden gelen değerinin, halka açık iştiraklerinden gelen değerle orantılı olduğu varsayımında bulunulmuştur. Buna göre holdinglerin adil fiyatları iştiraklerinin adil değerinin hesaplandıktan sonra bulunmuştur ve bu değerler 2020 yıl sonu borsa işlem fiyatlarıyla karşılaştırılmıştır. Hesaplamalara göre, BIST Holding ve Yatırımlar endeksinin %41.23'ünü oluşturan Koç Holding A.Ş., 70% oranında, endeksin %18'ini oluşturan Sabancı Holding A.Ş. %86 oranında, endeksin %4.95'ini oluşturan AG Anadolu Grubu Holding A.Ş. %81, endeksin %2.24'ünü oluşturan Eczacıbaşı Yatırım Holding A.Ş. %15 ve endeksin %0.26'sını oluşturan Mazhar Zorlu Holding A.Ş. ise %37 oranında iskontolu işlem görmektedir.

İkinci olarak, iştiraklerin piyasa işlem değeri baz alınarak holdinglerin değeri hesaplanmıştır. İlk değerlemeye tabi olan beş holdingin dışında on iki holdingin de değerlemesi 2011 ve 2020 yılları arasında yapılmıştır. Holdinglerin halka arz iştirak temsil oranları ile holding iskontosu her bir holding için ayrı ayrı incelenmiştir. Buna göre, farklı yıllarda farklı oranlarda iskontolu işlem göre holdingler olduğu gibi, adil değerinin üzerinde işlem gören holdingler ve yıllar da mevcuttur.

2020 yılı için iştiraklerin yeniden hesaplanmasından gelen holding adil değeri, iştiraklerin piyasa değerinden hesaplanan holding adil değeri ve holdinglerin piyasa değeri olmak üzere beş holding için üç farklı değer vardır. İkinci yönteme göre, Koç Holding A.Ş. %62 oranında iskontolu işlem görürken, bu oran Sabancı Holding A.Ş. için %71, AG Anadolu Grubu Holding A.Ş. için %76, Eczacıbaşı Yatırım Holding A.Ş. için %14 ve Mazhar Zorlu Holding A.Ş. ise %55'dir. Buna göre, endeksin %64'ü %62 ile %76 arasında iskontolu değer görmektedir. Her iki adil değer hesaplaması göstermektedir ki, endeksin çoğunu oluşturan holding şirketleri Borsa İstanbul'da iskontolu olarak işlem görmektedir.

1. INTRODUCTION

With the expansion of the products and services markets as a result of globalization, businesses have been increasing and expanding their scope and regions of operations. In order to sustain continuity and acquire a competitive advantage with these changes, businesses must adapt to the changes. These adjustments led to the creation of numerous national and international economic agreements as well as capital groups. One sort of commercial agreement between companies is called as holding company.

While a holding's organizational and economic structure differ by country, it has dominated the market in various European countries, particularly the United States (U.S.), and Japan since the first half of the 20th century (Daems, 1978; Nelson, 1996). Nowadays, holding companies are important for economies and stock markets. In 2020, the total asset value of top 25 U.S Holding Companies is United States Dollar (USD) 6,385 billion (*Top 25 U.S. Holding Companies - 2021 Edition*, n.d.). On the other hand, Turkiye's gross domestic product (GDP) is USD 720 billion (*GDP (Current US$) - Turkiye*, n.d.).

Holding companies and their subsidiaries play a crucial role in Borsa Istanbul (BIST), stock exchange market, where companies are publicly traded in Turkiye. For instance, Koç Holding (KCHOL) is one of the biggest companies in Turkiye listed on BIST, and it produced 6.4% of GDP and 6.7% of total export in 2020 by its own (*2020 Yıllık Faaliyet Raporu*, 2021). Turkish stock exchange market has an index specific for investment and holding companies, called BIST Holding & Investments (XHOLD).

Value has diverse meaning in different functional areas of management, however, as financial perspective it is directly linked to the overall goal of a company. The goal of maximizing company value is based on the wealth maximization premise of corporate finance, so a company's decision regarding finance, investments, and dividends has a

direct impact on the value of the company. Considering the importance of holdings, valuation of these organizations is critical for individuals who invest in holdings, as well as potential investors and other stakeholders. Due to their organizational structure, valuation of holding companies is a complex process. Additionally, holding companies may have characteristics of portfolio since holdings do not run operation themselves but own different companies. So, their performances strongly depend on their subsidiaries' performances.

Research shows that holding companies listed on stock markets are discounted with a variety of percentages in the world. Nevertheless, the research regarding the valuation of holding companies in Turkiye is very limited in the literature. The thesis motivation is contributing to the literature with valuing holding companies in Turkiye systematically, in parallel to that, providing a methodology to researchers and investors which is not only statistically significant, but also practically beneficial. The thesis analyses the holding companies and their subsidiaries which have certain criteria, looked for the answers to these research questions:

- How can holding companies be valued?
- Are the holding companies listed on BIST valued at a discount? If so, to what extend?

In this thesis, the values of the holding companies which fit particular criteria and listed on BIST are calculated by Sum of The Parts (SOTP) method. While applying this method, value of a holding company is derived from its subsidiaries. Further, holdings' values are calculated by their subsidiaries' market values between 2011 and 2022 with SOTP method. Then, the findings are compared with holdings' market stock values to answer research questions.

In the chapter 2, valuation methods are reviewed with advantages and disadvantages, while providing literature findings regarding valuation of holding companies. The chapter 3 focuses on the holding companies both in general and the ones listed on XHOLD. Also, the ones which are reviewed in the thesis are studied with reasons. In the chapter 4, the valuation methods are applied to the holding companies and their subsidiaries. The thesis concludes the findings with the contribution of this thesis, limitations, and further research areas in the chapter 5.

2. VALUATION METHODS

In a market economy, value is the key factor of measurement. People invest with the assumption that when they sell, the value of each investment will have increased by enough to compensate them for the risk they took and it is the case for all sorts of investments, including bonds, derivatives, bank accounts, and stock options. Therefore, a corporation is judged primarily on its ability to create value for its shareholders and the amount of value it creates. Hence, value is a particularly useful performance metric because it considers the long-term interests of all stakeholders in a company, not just shareholders (Goedhart et al., 2005).

Valuation is concerned with assessing a company's fair value. Different methods exist to determine the fair value, usually lead to different results and assessment ranges. Each of the valuation methods attempts to identify the worth of the company from a different perspective, and because each is based on distinct assumptions, the difference in value achieved may be contested. Moreover, each strategy has advantages and disadvantages. Therefore, there is not one absolute solution for valuation.

In this thesis, Discounted Cash Flow (DCF) model with breakdowns of Free Cash Flow to Firm (FCFF), Free Cash Flow to Equity (FCFE), Dividend Discount Model (DDM), and also Excess Return Model (ERM), and relative valuation are reviewed.

The valuations of manufacturing and financial service companies may vary because of two main reasons. First, the structure of financial service enterprises makes valuation difficult to quantify debt and reinvestment and making cash flow forecasting more complicated. The second is that financial service companies are regulated in many countries, and it is considered while valuation (Damodaran, 2012). Therefore, while analysing each method, it is also stated which types of companies these methods are suitable for.

2.1 Discounted Cash Flow (DCF)

The discounted cash flow valuation model assumes that a company's value equals to the present value of its forecasted future cash flows. Therefore, since this technique focuses on cash flow generation, the ability to create cash flows determines the worth of a business or an asset (Damodaran, 2012). In literature, DCF valuation is presented in the formula below (2.1).

$$V = \sum_{i=1}^{n} \frac{FCF_i}{(1+r_i)^i} + \frac{\frac{FCF_n \times (1+g)}{(r_n - g)}}{(1+r_n)^n} \tag{2.1}$$

First part of the formula shows that the sum of the estimated free cash flow in a specified period (n) by discounting them. The second part of the formula, which is called terminal value (TV), the discounting of the infinite cash flows that were prepared considering that the firm will operate forever after the specified time. In the formula, r_i stands for discount rate, and g stand for growth rate.

Several research show that explicit multiperiod valuation models based on discounted cash flow is prepared way of valuation (Penman, 2010; Palepu and Healy, 2013) since the theoretical approach can be also used in practice. Demirakos et al. (2004) show that analysts prefer either a Price Earnings (PE) model or an explicit multiperiod DCF valuation model.

2.1.1 Advantages and disadvantages of DCF

When determining the firm value using the DCF technique, the future cash flow of the company is computed while considering several value-generating elements such as the company's capital structure and future growth rates. In this perspective, the company's future cash flows are determined by the valuation of its assets and liabilities, as well as assets that are not stated in money and so are not reflected on the balance sheet, such as the power of brand and future innovations of the company. Because of these advantages, DCF is regarded as the best method for valuing a firm in financial theory and is widely utilized. The DCF technique is thought to best reflect the company's future performance, reflecting the effects of the company's investment and financing

policies on its value by focusing on the company's ability to create cash (Damodaran, 2012).

On the other hand, some criticism and sceptical concerns exist against DCF method. Since the terminal value is based on the estimated free cash flow and considering that is it highly sensitive to even small changes, there are always imprecise calculations. It should also be remembered that predicting the growth for FCF and infinite growth for terminal value is very difficult (Bodie et al., 2014). If there is an abnormal fluctuation of historical growth rate of a company, then future estimation may not be correct (Brigham & Houston, 2019). Additionally, management inefficiencies and managerial change affect a company's performance and indirectly the value of a company, so it should be kept in mind while valuation (Damodaran, 2018). Furthermore, not only the forecasting period and horizon of historical values used, but also accounting, which is the main source of valuation, can be deceiving because of either conservative perspective bookkeeping or applicable variable accounting methods (Palepu and Healy, 2013).

2.1.2 DCF models

There are three basics of DCF valuation: Free Cash Flow to Equity (FCFE), Free Cash Flow to Firm (FCFF) and Dividend Discount Model (DDM). As a definition, FCFE is the cash flow available to common stockholders, and FCFF is the cash flow available to all the suppliers of capital for a firm after the firm pays for all operating expenses and expenditures incurred for investment purposes which include capital expenditures (CapEx) and working capital investments (WC) (Kumar, 2016).

FCFF and FCFE calculations have different application steps. Beginning point of FCFE calculation is net income, whereas it is revenue for FCFF. Also, the discount rates are distinguished for each method. While valuating with FCFE, proper discount rate is cost of equity (k_e), on the other hand weighted average cost of capital (WACC) should be applied as a discount rate while valuating with FCFF. To conclude, it seems that the two methods are differentiated along with the type of cash flow to be used and the discount rates, nevertheless, theoretically both reaches the same result (Schmidlin, 2014).

Pereiro (2002) states that while valuing highly leveraged firms like banks and other financial institutions, usage of FCFE is typical. If the negative result arises from FCFE,

it may result in useless for an appraisal exercise. In this case, Kumar (2016) states that valuation by using FCFF is better if the capital structure is unstable and FCFE is negative. Additionally, as Damodaran claims (2012), although FCFE is based on net income, FCFF is based on operating income. Because financial leverage can increase net income, it is expected that operational income growth to be lower than net income growth as a rule. Furthermore, the growth rate derived from historical data may reflect the fundamentals more accurate than FCFE growth rate. Considering these statements, FCFE approach is used for valuation of banks and other financial institutes, and FCFF is used other commercial firms.

The other method DDM considers that the present value of future dividends paid by a company equals to the value of the company. The reason is that the value of an asset is the present value of expected cash flow that owners receive from the company. So, dividends can measure the cash flow that goes to the investor directly.

2.1.2.1 Free cash flow to firm (FCFF)

FCFF is the sum of all cash flows to the firm's claim holders, which includes common stockholders, bondholders, and preferred stockholders. The firm's free cash flow is the after tax (T) cash flow generated by its operations. It also means earnings before interest and tax, called as EBIT, multiplied by 1- T, minus CapEx and net working capital (NWC), which is called change in working capital (ΔWC), whereas depreciation and amortization expense (D&A) is added back. It consists of cash flows available to both debt and equity holders. The formula of FCFF is stated below (2.2):

$$FCFF = EBIT \times (1 - T) + D\&A - \Delta WC - CapEx \qquad (2.2)$$

FCFF is frequently called as an unlevered cash flow since this method prior to debt payments and it does not include tax benefits from interest payments. However, the structure of the formula requires it because cost of debt (k_d) in cost of capital already factored this benefit (Damodaran, 2012). Mainly, FCFF valuation depends on the result of three main stages: analysis of historical financial statements, estimating future financial statements and discounting free cash flow of a firm.

2.1.2.2 Free cash flow to equity

FCFE stands for the remaining cash flow available to shareholders, therefore it measures the potential dividends that a company can pay its shareholders. Positive FCFE indicates the firm's ability to pay dividends or buy back stock without jeopardizing the firm's operations or growth potential, whereas negative FCFE frequently means that the company needs issue additional shares to raise capital. The formula of FCFE is stated below (2.3):

$$FCFE = Net\ Income - CapEx + D\&A - \Delta WC\ - Repayment + New\ Debt \qquad (2.3)$$

There are some challenges of this method. First, firms may pay less cash than their FCFE to accumulate cash reserves for unanticipated capital development plans in the future. Earnings volatility may also force companies to take a more conservative approach to dividend pay-out policy. If dividends are taxed at a greater rate than capital gains, a company may pay out substantially less in dividends. Pay-out policy is frequently sticky, and management are hesitant to adjust dividend levels (Damodaran, 2012).

2.1.2.3 Dividend discount model (DDM)

In this model, the value of a stock is connected to the future expected dividends. Therefore, it is most appropriate for enterprises that have a consistent growth rate and pay dividends regularly. The model can be formulized in several ways depending on the duration of holding stock mainly. In the first model when the assumption of the model is that the stock is never sold and held for perpetuity, also the share price equals to the sum of all future dividends discounted by rate of return, which is the cost of equity (k_e). The formula is stated below (2.4), in which D_t represent the dividend received in the period *t* where it is as.

$$DDM = \frac{D_1}{1+k_e} + \frac{D_2}{(1+k_e)^2} + \cdots + \frac{D_n}{(1+k_e)^t} = \sum_{t=1}^{t=n} \frac{D_t}{(1+k_e)^t} \qquad (2.4)$$

Kumar (2016) states that one of the most significant drawbacks of this strategy is that it cannot be used to value stocks that do not pay dividends. The model's other shortcoming is that it cannot be used to value dividend-paying stocks with volatile growth characteristics. Moreover, the model's output is extremely sensitive to

assumptions about growth rate and necessary return. It is difficult for companies to maintain a consistent dividend increase rate when earnings are erratic. Dividend growth rates are rarely steady.

2.2 Excess Return Model (ERM)

Implementing an excess return model is a strategy applied to value especially financial service companies. According to this approach, a company's value can be expressed as the sum of its current capital investments and the present value of the excess returns which anticipates earning in the future. It is assumed that the return on equity is an accurate indicator of the economic return on equity investments. In this sense, the formula of ERM is stated below where r_e stands for return of equity (2.5).

$$ERM = (r_e - k_e) - \ Equity\ capital\ invested \qquad (2.5)$$

When assessing a financial services firm, the return on equity is calculated from the present and previous periods, but the necessary return on equity is the predicted future return. This necessitates an examination of the firm's strengths and weaknesses, as well as the firm's competition and changes in regulatory capital requirements.

This model's emphasis on excess returns is its most intriguing feature. The market value of a company's equity should converge on the equity capital that is already invested in it if it invests its equity and receives merely the fair-market rate of return on these investments. A company's stock market value will decline below the equity capital already invested if it receives a sub-market return on its equity investments. Additionally, this model also takes into account anticipated future investments. As a result, the analyst utilizing the model is responsible for predicting both the direction of the financial services company's future investments as well as the returns on those investments (Damodaran, 2012). In this thesis, ERM is applied to Yapı ve Kredi Bankası A.S (YKBNK) as an example of financial service firm in the chapter 4.

2.3 Relative Valuation

The use of data from similar firms with the same features serves as the foundation for relative valuation. Profit, cash flow, book value, and revenue are some of the factors

that influence the value of a company's shares, so the value is attempted to be calculated using the ratios associated with these variables in this technique.

There are various formulas applied to evaluate companies' performances in various aspects. As an example, PE is calculated to measure the current share price of the firm relative to its earnings per share. The ratio indicates that whether the stock price is overvalued or undervalued compared to the earnings of the firm. It is also a measurement of what the market agrees to pay for the current performance besides the potential growth of the firm. Since it is a relative valuation technique, the comparison with others is needed to understand if the company performs well. For instance, to assess if PE ratio is high or low, the comparison of calculated ratio with the industry average may give the general idea (Hitchner, 2011).

PE ratio might be misleading in some cases. PE ratios rise with leverage for corporations whose unlevered PE, meaning that when companies are exclusively financed by the equities, is larger than one over the cost of debt. As a result, a corporation with a relatively high equity can artificially raise its PE ratio by exchanging debt for stock. Also, the PE ratio is calculated using earnings, which contain various non-operating items like restructuring costs and write-offs (Goedhart et al., 2005).

Since the idea of relative valuation is analysing a company with comparison of the other similar companies, then there might be some difficulties arise, especially considering multi-business organizations. The difficulties in valuing a multi-business organization that works in multiple marketplaces become clear. It is unable to locate comparable companies unless finding other organizations with a similar mix of business and regional operations, which is an unlikely scenario.

2.4 Valuation of Holding Companies with Sum of the Parts (SOTP)

Holdings have complex organizational structure, so valuation of these companies is also difficult, besides of the difficulty of valuation as a concept itself. Since holding companies have not run operation by themselves, the valuation methods of this type of organization may also vary as well as these can be valued similar to manufacturing firms such as relative valuation. However, the method is applied in this thesis is called 'Sum of the Parts' (SOTP).

SOTP valuation is a method in which the overall value of the holding equals the total value of the associated entities (Goedhart et al., 2005). In this method, the first step is multiplying the calculated fair value of each subsidiary with ownership rate of holding company and sum. Then, the result is divided by the total number of shares outstanding by holding to find fair value of one share. It is assumed that the total value of non-public subsidiaries is parallel with the calculated value of public subsidiaries proportionally. So, the proportion of public-subsidiaries and non-public subsidiaries are calculated with the usage of a key financial indicator. Since fair value of holding's one share calculated by public-traded subsidiaries is known, the total value of the holding is computed by applying the value of publicly traded affiliates as a percentage to the entire holding company. The application of this methos is explained with a hypothetical example.

ABC is a holding company which have three subsidiaries named X, Y and Z. The X and the Y are the public-subsidiaries with 10 outstanding shares each. Also, the ownership rate of the X is 20% and the ownership rate of the Y is 50%. On the other hand, Z is not public-traded subsidiary, and the ownership rate is not known. If the fair value of X per share is calculated Turkish Lira (TRY) 100, the fair value is multiplied by 10 to find the company's total value. The result is multiplied by 20%, the ownership rate to assess its contribution to the holding. Similarly, if the fair value of Y per share is TRY 200, the total value TRY 120 is contributed to the holdings value. In summary, TRY 120 is composition of public-traded companies. As a simplicity, if ABC holding has 120 shares, the fair value from public-traded subsidiaries by per share TRY 1.

To compute the total value of holding, it is needed to know which percentage of holding company's total value based on key financial indicator is derived from its public-traded subsidiaries. Otherwise, the estimation of holding's total value with contribution of subsidiaries cannot be calculated. In this step, shareholder's value is applied as the key financial indicator. It is reviewed that the shareholder's equity values of ABC holding, X, Y and Z companies are consecutively TRY 500, TRY 100, TRY 200, and TRY 200. Therefore, 60% of the ABC holding company is composed of public subsidiaries. This ratio is used to calculate the total value of holding by applying to the amount derived from public-traded subsidiaries. In other words, the value of the non-public subsidiaries is parallel proportionally with the value of the

publicly traded companies. Since 60% of the holding's value is TRY 1, then the total fair value per share of the holding is TRY 1.66 as a result of SOTP valuation.

2.5 Valuation of Holding Companies in Literature

Examining the literature on determining the value of holding corporations reveals that the topic is theoretically less researched. There are many research papers on the valuation of diverse portfolios of assets, despite regular studies evaluating those portfolios with respect to their capital structures and financial performances.

Berger and Ofek (1995) show that holding companies are valued in several methods including valuation of their subsidiaries and the values of holding companies are 13%-15% lower than the values of their subsidiaries in the USA.

Lins and Servaes (1999) show that diversified Japanese companies are discounted as 10% and the rate for British companies is 15%. Also, they claim that a country's institutional framework has an impact on the benefit of diversification whereas there is no universal pattern appears across nations.

Ferreira and Santa-Clara (2011) forecast the stock market returns by three methods: the dividend-price ratio, earnings growth, and the sum of the parts. The robustness level of SOTP method and its performance are better than the other because of the low estimation error.

Khorana et. al. (2011) study that conglomerates trade at a large disadvantage to pure-play corporations in the majority of areas throughout the world, but at a premium in select other places. Global discount is 5.5% whereas Central and Eastern Europe, the Middle East and Africa (CEEMEA) region is 11.7%.

Ahn. et. al. (2012) state that the biggest six Korean holding companies are averagely 30%-60% discounted and the discount ratio calculated for SK C&C Holding is the parallel to the other holdings with 60%.

Jang (2017) investigates why Korean holding companies traded below their net asset value and as a result, the holding's worth is lower than the overall value of the associated companies since investors invest directly in affiliated companies rather than holding companies.

Damodaran (2009) reviews the valuation of holdings or multi-national firms and he investigates the best valuation technique to value these companies. He concludes that since multi business companies have complexity and information gaps compare to single business firms, the crucial aspect for investors is deciding if the complexity exposes additional risk and converting the concerns into value.

Kuloglu (2019) applied SOTP as a valuation method to three holding companies which are Koç Holding A.S, Sabancı Holding A.S and Türkiye Şişe ve Cam Fabrikaları A.Ş. As a result, he found that the discount rate of these companies in Turkiye in 2017 is between 13% and 24%. He also reviewed the duplication effect of these companies to the index overall. Since this study is about the valuation of holding companies in Turkiye, it can be considered as a benchmark for this thesis.

Kadiroglu and Yilmaz (2017) study the validity of Free Cash Flow method in BIST. The findings show a substantial negative association between free cash flow and dividends per share. In parallel to that leverage and free cash flow have a similar strong, adverse connection. On the other hand, the findings validate the free cash flow in BIST.

3. HOLDING COMPANIES

As a dictionary definition, holding company means a company whose main purpose is to control another company or companies through owning shares in it or them (*Holding*, n.d.). In parallel to this definition, Daems (1978) emphasizes that the concept of control is the key term in this description since the struggle for corporate control distinguishes the holding company from other financial entities like mutual funds.

Similar to other legal entities, holding companies have several objectives. Maintaining the existence, minimizing potential threats, sustainable growth and the acquisition of the necessary resources are among the most important ones. As with all other organizations, holdings want to achieve sustainable growth. In addition to these economic reasons, there is a psychological side to growth and development. This is due to the fact that having a larger organization or managing it is correctly proportionate to social dignity (Doğan, 1999). The other objective is to manage the companies that are affiliated to the holding. Accordingly, it can be drawn attention to the strong capital structure of the holding. The survival of the holdings financially is ensured by transferring them to the holding in parallel with the profit ownership ratio obtained from the annual activities of the subsidiaries, since the holding itself does not operate in commercial activities (İpekçi, 2000).

The difference between the holding and the investment company stems from the management of the company. Investment companies incorporate many shares in their portfolios to mitigate risks and increase returns, while management is not concerned. On the other hand, holding companies directly participate in the management of their companies (Akgüç, 2010; Okka, 2021). From this perspective, the holding is an umbrella, a company that manages other companies.

Holdings can be grouped in various ways. In terms of the field activities, there are two types of holdings: pure holding and mixed holding. A pure holding corporation does not have any business operations under its own name. Holding stock in other corporations so that it can control their operations is one of its functions (Green, 1933). Moreover, mixed holdings are characterized as businesses that operate in multiple industries by purchasing the stock of other businesses. Holdings can also differ in many aspects such as their character, the types, and the activities of subsidiaries they own, their own corporate purposes and so on. These differences generate several advantages and disadvantages compared to other organizational structures.

3.1 Advantages and Disadvantages of Holding Companies

Holdings have various advantages over other organizational types, and these are managed in managerial and financial terms. Holding companies generally acquire subsidiaries through the purchase of stock. They may also create subsidiaries by spin-offs of operating units. While they may be less common than their parent companies, holding companies can be beneficial for generating profits and protecting assets. Moreover, because it has a larger position, the holding company may produce value for its stockholders by exerting more influence over management than most small individual investors. Holding companies may own all the stock in a subsidiary company, or they can own a majority of it. They control the policies and operations of their subsidiaries, and they have their own boards and managers. The holding company may also have assets such as patents, trademarks, or real estate. By closely monitoring management, the holding company creates wealth for its shareholders while increasing the value of the companies it owns. Also, a holding company can deliver value by providing services to the companies in which it has a stake, such as supplying their financial needs or managing their tasks (Deloof et al., 2004).

Holding companies may also benefit from tax rules and regulations through the transfer pricing, and taxation in low-tax countries (Ficbauer, 2015). In some jurisdictions, such as the United States, when a holding company possesses a particular percentage of the ownership and control rights of its subsidiary, their incomes might be consolidated to calculate taxes owed (Schill and Zhou, 2001).

Besides the advantages of holding companies, there are some disadvantages as well. Holding companies can be complex and not suitable for all businesses. Also, these

organizations have a higher administrative responsibility, limited to their financial liability to subsidiaries. Assignment of this responsibility to affiliates will create an atmosphere of distrust within the holding. Any unrest against management will affect the performance and therefore profitability of the subsidiaries. In addition, subsidiaries may not be able to run their financial processes properly if they are exposed to more profit pressure (Kuloğlu, 2019).

3.2 Holding Companies in the World

Since the early years of the nineteenth century, the industrial and transportation sectors have grown in response to the growth of the western population, the construction of the national railway network, the expansion of the urban market, and, most notably, the invention of the internal combustion engine and electricity. With all these changes, the first examples of aggregation began to emerge in the U.S (Chandler, 1959).

Holding companies have long been controversial. The public utilities holding companies of the 1920s were attacked as monopolistic by the federal government, which passed laws to regulate them. As a result, the Standard Oil Company of John D. Rockefeller's Standard Oil Company met its demise in the United States Supreme Court. This attack ultimately led to the creation of the Public Utility Holding Company Act, which regulates these companies. The government also brought under federal control corporations that controlled two or more banks. During the 1920s, Dupont and General Motors were pioneers in the development of structures comprised of many sectors. The Celler-Kefauver Act of 1950 restricted transactions that could limit competition in the same sector in terms of horizontal and vertical expansion. As a result, businesses have begun to focus on acquisitions in a variety of industries. From the late 1960s to the early 1980s, this expedited the growth of holding structures. In the 1980s, the "portfolio firm" model of growing by owning companies in many sectors was a strategy for company growth. This pattern of expansion persisted throughout the 1980s (Davis et al., 1994).

Nowadays, holding companies are also one of the key elements in economies and stock exchange markets. Holding companies may operate in many different areas, such as agriculture, construction, utilities, food, financial service, and these diversification enables them to reduce the risk overall. Moreover, these are not only diversified in operation areas, but also the countries operating. Therefore, as a result of

consolidation, these companies have very strong financial structure. For instance, top 25 U.S. Holding companies listed in the table 3.1 have USD 6,385 billion total asset value in 2020 which figure is roughly 8.5 times the Turkiye's GDP in the year (*Top 25 U.S. Holding Companies - 2021 Edition*, n.d.).

Table 3.1 : TOP 25 U.S Holding Companies in 2020 ('000 USD)

Rank	Company Name	Total Assets
1	Prudential Financial, Inc.	940,722,000
2	Berkshire Hathaway Inc.	873,729,000
3	MetLife, Inc.	795,146,000
4	American International Group, Inc.	586,481,000
5	Lincoln National Corporation	365,948,000
6	Principal Financial Group, Inc.	296,627,700
7	Equitable Holdings, Inc.	275,397,000
8	Brighthouse Financial, Inc.	247,869,000
9	UnitedHealth Group Incorporated	197,289,000
10	Pacific Mutual Holding Company	190,672,000
11	Voya Financial Inc.	180,518,000
12	Ameriprise Financial, Inc.	165,883,000
13	Aflac Incorporated	165,086,000
14	Liberty Mutual Holding Company Inc.	145,377,000
15	The Allstate Corporation	125,987,000
16	The Travelers Companies, Inc.	116,764,000
17	Genworth Financial, Inc.	105,747,000
18	Anthem, Inc.	86,615,000
19	Reinsurance Group of America, Inc.	84,656,000
20	Loews Corporation	80,236,000
21	Hartford Financial Services Group, Inc.	74,111,000
22	American Financial Group, Inc.	73,566,000
23	Amer Equity Investment Life Holding Co	71,389,674
24	Unum Group	70,625,800
25	Centene Corporation	68,719,000

Note. Adapted from https://news.ambest.com/articlecontent.aspx?refnum=309855&altsrc=43. Copyright 2022 by A.M. Best Company

3.3 Holding Companies in Turkiye

The importance of holdings, first appeared in Turkish corporate life in the 1960s, has gradually grown and is anticipated to grow more in the future. The word 'holding' were not fully recognized and used in the 1950s. Indeed, holding structures were visible under various shapes and names. Sümerbank, for example, operated in several areas and resembled a holding in nature, despite its varied structure (Ildır, 2003). Then, the word itself has become a fashionable in 1960s.

Holding companies listed on stock exchange market is also important. In the table 3.2, the incorporated companies (Anonim Şirketi, A.Ş.) listed in XHOLD are provided with the market cap values at the end of 2020.

Table 3.2 : Holding Companies Listed on XHOLD in 2020 (in '000 TRY)

Code	Name of the Holding Company	Market Cap
AGHOL	AG Anadolu Grubu Holding A.Ş.	6,434,182
AKYHO	Akdeniz Yatırım Holding A.Ş.	213,857
ALARK	Alarko Holding A.Ş.	3,758,400
AVHOL	Avrupa Yatırım Holding A.Ş.	181,332
BERA	Bera Holding A.Ş.	6,927,648
BRYAT	Borusan Yatırım ve Pazarlama A.Ş.	12,850,313
DAGHL	Dagi Yatırım Holding A.Ş.	139,320
DENGE	Denge Yatırım Holding A.Ş.	837,000
DERHL	Derluks Yatırım Holding A.Ş.	244,755
DOHOL	Dogan Sirketler Grubu Holding A.Ş.	8,034,001
ECILC	Eis Eczacıbaşı İlaç Sinai ve Finansal Yatırımlar San. ve Ticaret A.Ş.	5,112,040
ECZYT	Ecacıbaşı Yatırım Holding Ortaklığı A.Ş.	2,912,700
EUHOL	Euro Yatırım Holding A.Ş.	170,400
GLRYH	Güler Yatırım Holding A.Ş.	326,100
GLYHO	Global Yatırım Holding A.Ş.	1,525,158
GSDHO	GSD Holding A.Ş.	1,129,500
IEYHO	Işıklar Enerji ve Yapı Holding A.Ş.	619,699
IHLAS	İhlas Holding A.Ş.	980,096
IHYAY	İhlas Yayin Holding A.Ş.	513,000
INVEO	İnveo Yatırım Holding A.Ş.	1,326,600
ITTFH	İttifak Holding A.Ş.	856,320
KCHOL	Koç Holding A.Ş.	53,558,167
MARKA	Marka Yatırım Holding A.Ş.	134,966
METRO	Metro Ticari ve Mali Yatırımlar Holding A.Ş.	624,000
METUR	Metemtur Yatırım Enerji Turizm Ve İnşaat A.Ş.	397,800
MZHLD	Mazhar Zorlu Holding A.Ş.	341,117
NTHOL	Net Holding A.Ş.	1,934,094
OSTIM	Ostim Endüstriyel Yatırımlar ve İşletme A.Ş.	311,022
POLHO	Polisan Holding A.Ş.	2,927,810
RALYH	Ral Yatırım Holding A.Ş.	279,720
SAHOL	Hacı Ömer Sabancı Holding A.Ş.	23,383,029
SISE	Türkiye Şişe Ve Cam Fabrikaları A.Ş.	22,392,095
TAVHL	Tav Havalimanları Holding A.Ş.	7,737,891
TKFEN	Tekfen Holding A.Ş.	6,138,300
TRCAS	Turcas Petrol A.Ş.	1,239,660
VERUS	Verusa Holding A.Ş.	3,157,000
YESIL	Yeşil Yatırım Holding A.Ş.	6,434,182

3.3.1 SOTP application criteria

Considering the purpose of the study and the requirements of the model, particular criteria are followed. The first criterion is holding company should have at least one publicly traded subsidiary since the fair value of holding is calculated by using its subsidiaries. If any subsidiary is not listed in stock market, then the financial statements are not available in most cases in practice.

Second, it is critical that the publicly traded subsidiaries of the holding included in the analysis should provide a reliable estimation of the holding. Holding's equity value is predominantly provided by publicly traded subsidiaries, which is computed by a ratio of key financial indicator. If the ratio of key financial indicator of public subsidiaries in total size is low, then it makes calculating the holding value from them less meaningful. To overcome this challenge, after analysing revenue, EBIT, and shareholder's equity, it is decided that shareholder's equity value is statistically better than the others. So, while calculating public subsidiaries value, the total value of non-public subsidiaries is computed in parallel to that.

Seventeen holding companies listed on XHOLD have at least one public-traded subsidiary. For these ones, it is assessed how much of a holding's subsidiaries constitute the holding's equity. The first step is determining the subsidiaries share ownership ratios for the holding companies. So, financial audit reports published in each quarter between 2011 and 2020 are reviewed and the ownership rates of subsidiaries are noted. The financial statements used in the paper are extracted by the database of Public Disclosure Platform (PDP) and Microsoft Excel Professional Plus 2019 is used for computing valuation process. Then, shareholder's equity values are distinguished for all subsidiaries at the same period. Since equity values and holdings ownership rates are known because of the previous steps, these two results are multiplied, respectively. The figure obtained as a result of the calculation is divided by the equity value of the holding. As a result, the subsidiary representation for holdings is evaluated.

In theory, it is expected that all the holding companies have forty historical values between 2011 and 2020. However, it is not applicable for all of them. For instance, AG Anadolu Grubu A.Ş. (AGHOL) were established in 26th of December 2017, when three companies joined together to operate under one holding company. Therefore,

AGHOL has the ownership values between 2012 and 2017 December with thirteen available values.

The rates stated are also evaluated statistically. Minimum (min), maximum (max), arithmetic average (avg), standard deviation (Std. Dev.), and the number of data used in the analysis are shown in the table 3.3, where the companies listed alphabetically.

Table 3.3 : Statistical analysis of the holding companies[1]

Code	Holding Name	Min	Max	Avg	Median	Std.Dev.	Quantity
AGHOL	AG Anadolu Grubu Holding A.Ş.	51%	56%	53%	53%	2%	13
ALARK	Alarko Holding A.Ş.	21%	57%	34%	33%	10%	40
DOHOL	Dogan Sirketler Grubu Holding A.Ş.	2%	7%	4%	3%	2%	40
ECZYT	Eczacıbaşı Yatırım Holding Ortaklığı A.Ş.	42%	66%	51%	50%	8%	40
GLYHO	Global Yatırım Holding A.Ş.	3%	20%	11%	12%	6%	40
GSDHO	GSD Holding A.Ş.	4%	10%	7%	8%	2%	31
SAHOL	Hacı Ömer Sabancı Holding A.Ş.	36%	48%	40%	39%	3%	40
IEYHO	Işıklar Enerji Ve Yapı Holding A.Ş.	10%	69%	29%	29%	14%	26
IHLAS	İhlas Holding A.Ş.	24%	51%	33%	33%	5%	25
IHYAY	İhlas Yayın Holding A.Ş.	25%	62%	52%	55%	9%	40
ITTFH	Ittifak Holding A.Ş.	4%	98%	67%	76%	30%	38
KCHOL	Koç Holding A.Ş.	42%	61%	50%	50%	5%	40
MZHLD	Mazhar Zorlu Holding A.Ş.	53%	77%	73%	73%	4%	40
METRO	Metro Ticari ve Mali Yatırımlar Holding A.Ş.	9%	41%	19%	13%	11%	21
NTHOL	Net Holding A.Ş.	0%	1%	1%	1%	0%	19
TKFEN	Tekfen Holding A.Ş.	2%	3%	2%	3%	1%	25
VERUS	Verusa Holding A.Ş.	35%	48%	38%	37%	4%	13

As it is stated above, one of the key points is the proportion of subsidiaries representing holding companies because the proportion of non-publicly traded subsidiaries are set in parallel to publicly traded ones. If the rate is low, then value of holding might not be estimated properly since the calculated ratios are used to compute total value of the holding companies after valuing the subsidiaries. Moreover, in terms of the purpose of thesis, it is important that the holding companies valued are needed to have representative ratio to generalization.

[1] In this point, the aim is obtaining only one ratio which represents the percentage of the public-traded substitute of a holding company. Since I calculated holding companies' ownership rates between 2011 and 2020 quarterly basis, totally forty observations are obtained as percentages. However, there might be some cases less than forty since either there is no available quarter values or holding company may establish later than 2011. The quantities are presented under quantity column. Statistically, 'minimum' represents the lowest of the obtained ratios, 'maximum' represents the highest of the obtained ratios and 'average' represents arithmetic mean of the obtained ratios. Additionally, standard deviation is presented under its heading.

Koç Holding (KCHOL), Sabancı Holding (SAHOL), and AG Anadolu Grubu Holding (AGHOL), Mazhar Zorlu Holding (MZHLD), and Eczacıbaşı Yatırım Holding (ECZYT) consist of 67% of XHOLD. These are valued with SOTP methodology and their subsidiaries' fair values are calculated. Moreover, the seventeen holding companies listed above are valued with SOTP, but the market values are taken into consideration for the subsidiaries. Therefore, there is no fair value calculation for the subsidiaries. The details for both approaches are given in the chapter 4.

3.3.2 General information about the holding companies

3.3.2.1 Koç Holding

It was established in 1938 as Koç Trade Corporation by Vehbi Koç. Since it had grown rapidly while operating several different activity fields, the organizational structure was changed to holding in 1963 and it is the first holding firm in Turkiye. According to the company activity report in 2020, holding has the four of the biggest industrial firms in Turkiye: Turkiye Petrol Rafineleri Tüpraş (TUPRS), Ford Otosan (FROTO), Arcelik A.Ş. (ARCLK) and Tofaş Turk Otomotiv Fabrikası (TOASO) (*Koç Holding Tarihçe*, n.d.). The other subsidiaries are Aygaz A.Ş. (AYGZ), Marmaris Altınyunus (MAALT), Otokar Otomotiv ve Savunma Sanayi A.Ş. (OTKAR), Tat Gıda A.Ş. (TATGD), Türk Traktör ve Ziraat Makineleri A.Ş. (TTRAK), Yapı ve Kredi Bankası (YKBNK), Koray Gayrimenkul Yatırım Ortaklığı A.Ş. (YKGYO).

Koç Holding (KCHOL) is 30% of XHOLD based on the market cap value in 2020. Moreover, on Fortune magazine's list of the 500 biggest industrial firms in the world (Fortune Global 500) in 2020, it is rated 471st out of 500 (*Fortune 500*, n.d.).

3.3.2.2 Sabancı Holding

Through its subsidiaries and affiliates, Sabancı Holding, one of the largest conglomerates in Turkiye, engages in a wide range of commercial operations, mostly in the banking, financial services, energy, industrials, construction materials, and retail industries. By the end of 2021, Sabancı Group firms have been operating in 13 nations and exporting their goods to areas across Europe, the Middle East, Asia, North Africa, and North and South America. These companies have a value-focused, data-driven ecosystem. Prominent international corporations are among Sabancı Holding's partners in business. The Capital Markets Board has registered Sabancı Holding, and

since 1997, the company's shares have been traded on the Borsa Istanbul (*Sabancı Group in Brief*, n.d.).

Sabancı Holding has nine publicly traded companies; Akbank Türk A.Ş. (AKBNK), Akçansa Çimento Sanayi ve Ticaret A.Ş. (AKCNS), Kordsa Teknik Tekstil A.Ş. (KORDS), Agesa Hayat ve Emeklilik A.Ş. (AVISA), Brisa Bridgestone Sabancı Lastik Sanayi ve Ticaret A.Ş. (BRISA), Carrefour Sabancı Ticaret Merkezi A.Ş. (CRFSA), Çimsa Çimento Sanayi ve Ticaret A.Ş. (CIMSA), Teknosa İç ve Dış Ticaret A.Ş. (TKNSA), Aksigorta A.Ş. (AKGRT). Whereas AKBNK, AVISA and AKGRT are financial service firms, the others are manufacturing firms.

3.3.2.3 AG Anadolu Grubu Holding

Anadolu Group was founded in 1950 by the Yazıcı and Özilhan families. The group has operated the business in many different areas such as agriculture, energy and industry, beer, and beverage, automotive and retail. The shareholders of Anadolu Grubu A.Ş., which are Yazıcılar Holding A.Ş., Özilhan Sınai Yatırım A.Ş. and Anadolu Endüstri Holding A.Ş., have merged under one roof under the name AG Anadolu Grubu Holding A.Ş., with equal representation and management rights of the founder Yazıcı and Özilhan families in 2017 (*Genel Bakış*, n.d.). Therefore, historical data available since 2017 is used for valuation of subsidiaries and computing the shareholder’s equity rate and subsidiaries ownership rate.

AG Anadolu Grubu Holding has five public-traded manufacturing companies: Adel Kalemcilik Ticaret ve Sanayi A.Ş. (ADEL), Anadolu Efes Biracılık ve Malt Sanayi A.Ş. (AEFES), Anadolu Isuzu Otomotiv Sanayi ve Ticaret A.Ş. (ASUZU), Coca-Cola İçecek A.Ş. (CCOLA), Migros Ticaret A.Ş. (MGROS).

3.3.2.4 Eczacıbaşı Yatırım Holding

In December 1973, Eczacıbaşı Yatırım Holding was founded. In February 1974, the company offered 50% of its shares to the public, making it one of the first businesses in Turkiye listed on stock exchange market. The organization's principal activity is to become a partner in businesses that are already established or are planning to be in places it deems acceptable, where it can offer consistent dividends, and to take part in capital increases of businesses in which it is a partner (*Eczacıbaşı Yatırım Holding Ortaklığı A.Ş.*, n.d.).

Eczacıbaşı Yatırım Holding has two publicly traded companies; Eis Eczacıbaşı İlaç, Sınai ve Finansal Yatırımlar Sanayi ve Ticaret A.Ş. (ECILC) and Intema İnşaat ve Tesisat Malzemeleri Yatırım ve Pazarlama A.Ş. (INTEM).

3.3.2.5 Mazhar Zorlu Holding

In the 1950s, Mazhar Zorlu founded his business and main operational activities were related to governmental constructions. With the introduction of plastic plates and pharmaceutical tubes in 1958, the company became pioneer in pipe and plastic industries. The holding's several subsidiaries, which operate in nations including Germany, Kazakhstan, and Romania, are all privately held except for Egeplast Ege Plastic Ticaret ve Sanayi A.Ş. (EPLAS) (*Kurucumuz*, n.d.).

4. APPLICATION OF VALUATION METHODS

In this chapter, first, TOASO is valued with FCFF method as an example of manufacturing firms. Second, YKBNK is valued with ERM method as an example of financial service firms. Third, KCHOL, SAHOL, AGHOL, ECZYT and MZHLD are valued with SOTP method as an example of holding companies. In this part, the values derived from the subsidiaries are used. Fourth, the seventeen holding companies are valued with SOTP method by using the market values of the subsidiaries, instead of calculating the fair values. Lastly, the findings derived from the two approaches and the market values are compared with the literature.

4.1 Valuation of Manufacturing Firm TOASO with an Application of FCFF

Analysis of historical financial statements, estimating future financial statements and discounting free cash flow of a firm are the three main stages of valuation with FCFF. The analysis of the historical financial statements is made for the last 6 years period including the valuation year (2020) to obtain 5 ratios represent the changes. When valuing a firm in 2020, the historical data is used between 2015-2020. Moreover, the next five years are estimated as a part of future financial statements, which is also generally applied period (Hitchner, 2011; Healy and Palepu, 2013; Brigham and Houston, 2019). After projecting this period, the terminal value (TV) is calculated as the infinite value for the following periods. During the analysis, the results are checked within the framework of current positioning and logic. It also means that although the core formulations are followed, manual interventions and adjustments are made if necessary. All the adjustments are listed in the appendix.

4.1.1 The analysis of historical financial statements

Historical values of the key financial items, which are part of either balance sheet or profit and loss statement, are analysed between 2016 and 2020. It is essential to make accurate analysis of historical values because the findings are used to compute future estimated values, which is also another critical point of FCFF method. If a firm's historical financial statements are analysed correctly, then the future estimation will result in more accurate since all projections depend on the historical values.

The financial statements are analysed in two ways; either the change of a financial item compared to the previous years, or the ratio of a financial item to another financial item by years. Whichever method is applied, the findings are represented by percentage. Then, the findings are multiplied by the fixed weighted averages yearly basis to have only one ratio which is used to forecast financial items. To reflect the current year's position better, the weights are applied instead of arithmetic mean. The percentage of weight used for each year is shown in table 4.1.

Table 4.1 : Weights per year as percentage

Years	Weight	Percentage
2020	5/15	33%
2019	4/15	27%
2018	3/15	20%
2017	2/15	13%
2016	1/15	7%

According to the table above, financial ratio result in 2020 is multiplied by 0.33, the result in 2019 is multiplied by 0.27 and the rest accordingly. Then, the findings are summed up to obtain one unique ratio, which is used while forecasting future values.

4.1.1.1 Analysis of revenue, cost of goods sold (COGS) and gross profit

The faster firms can grow and the more value they can create, which attracts investor. A company's main goal is cash flow generation at rates of return on invested capital (ROIC) greater than the cost of capital. A company's ROIC and revenue growth is linked strictly since these together determine the amount of cash flow generated. Also, the items in income statement are rely on revenues both directly and indirectly (Goedhart et al., 2005). So, revenue is one of the key elements of investment and valuation, also projecting other items depends on their weight considering revenue.

The historical revenue values are analysed by calculating yearly changes. Then the results are multiplied by the fixed weights yearly basis to obtain one percentage used for forecasting future values. The historical revenue values of TOASO are placed in the table 4.2 and the rate used for the projecting future revenue for the company in 2020 is 15,87% as a result of computation.

Table 4.2 : Historical revenues of TOASO between 2016-2020

Year	Revenue (TRY)	Δ in Revenue (%)
2020	23.556.747.000	24,66
2019	18.896.914.000	1,58
2018	18.603.331.000	6,50
2017	17.467.806.000	22,7
2016	14.235.951.000	43,50
2015	9.920.723.000	

COGS is the sum of all direct cost linked to a product, so it is parallel to revenue value. So, first the ratios of COGS to revenue are calculated for 5 years. The findings are multiplied by the fixed weights and the key ratio is 87.53%. Furthermore, the difference between revenue and COGS is called gross profit and the values are obtained from profit and loss financial statement (P&L). The values are presented in table 4.2 below:

Table 4.3 : COGS and gross profit of TOASO in 2016-2020 (in million TRY)

P&L Items	2015	2016	2017	2018	2019	2020
Revenue	9,921	14,236	17,468	18,603	18,897	23,557
COGS	- 8,781	- 12,888	- 15,552	- 16,190	- 16,510	- 20,440
Gross Profit	1,140	1,348	1,916	2,413	2,386	3,117

4.1.1.2 Analysing expenses and other income from operating activities

Sales and marketing expenses (S&M), general and administrative expenses (G&A), research and development (R&D) expenses and other income/expense from operating activities exist after gross profit. Since these lines linked to revenue, the weighted average of the ratios for these lines are used to forecast. In table 4.4, the values are presented below.

Table 4.4 : P&L Lines of TOASO in 2020 (in million TRY)

P&L Items	2015	2016	2017	2018	2019	2020	Ratio (%)
S&M Expenses	-218	-252	-273	-330	-373	-391	-1.76
G&A Expenses	-280	-329	-393	-362	-337	-480	-2.00
R&D Expenses	-10	-23	-56	-66	-69	-76	-0.33
Other Income from Operating Activities	798	802	1,042	3,315	959	1,381	8.04
Other Expense from Operating Activities	-821	-845	-1,283	-3,892	-1,018	-1,582	-9.23

4.1.1.3 EBIT

EBIT value is the summarization of all the lines mentioned before. So, EBIT value does not require any ratio calculation. In the table 4.5, EBIT calculation is presented.

Table 4.5 : EBIT calculation of TOASO in 2020 (in million TRY)

Items	2015	2016	2017	2018	2019	2020
Gross Profit	1,140	1,348	1,916	2,413	2,386	3,117
S&M Expenses	-218	-252	-273	-330	-373	-391
G&A Expenses	-280	-329	-393	-362	-337	-480
R&D Expenses	-10	-23	-56	-66	-69	-76
Other Income from Operating Activities	798	802	1,042	3,315	959	1,381
Other Expense from Operating Activities	-821	-845	-1,283	-3,892	-1,018	-1,582
EBIT	610	701	954	1,077	1,548	1,970

4.1.1.4 Plant, property, and equipment (PPE)

Goedhart et al. (2005) state that PPE is also connected to revenue although it is a balance sheet item. Similar to the other lines, the weighted average ratio can be calculated by each year's PPE amount divided by relevant year's revenue, and the result is used while forecasting future PPE values. The average rate of change in PPE for TOASO in 2020 is calculated as 11.16% and the ratio 11.16% is multiplied by the revenue value of each forecasted year. The details are presented in the table 4.6.

Table 4.6 : PPE/revenue ratio for TOASO between 2016-2020 (in '000 TRY)

Year	Revenue	PPE	PPE/Revenue (%)
2020	23.556.747	2.037.483	8,65
2019	18.896.914	2.112.220	11,18
2018	18.603.331	2.247.601	12,08
2017	17.467.806	2.350.019	13,45
2016	14.235.951	2.320.618	16,30

4.1.1.5 Depreciation and amortization (D&A)

Depreciation is the allocation of historical costs of fixed assets against annual revenues over time (Gitman, 2002). Since D&A is connected to PPE amount, then it can be esteemed as a percentage of PPE directly and a percentage of revenue indirectly. The

average D&A ratio is calculated by weighted average of the ratios to PPE, as 18.27%. While forecasting D&A value, this ratio is multiplied by the estimated PPE value. In the table 4.7, the historical values for TOASO regarding D&A and PPE are presented.

Table 4.7 : D&A ratio for TOASO between 2016-2020 (in '000 TRY)

Year	D&A	PPE	PPE/D&A Ratio (%)
2020	399.691	2.037.483	19.62
2019	405.662	2.112.220	19.21
2018	417.817	2.247.601	18.59
2017	369.883	2.350.019	15.74
2016	276.432	2.320.618	11.91

4.1.1.6 Net working capital (NWC)

NWC is equal to the sum of trade receivables (AR) and inventory (INV) minus trade payables (AP). Also, change in net working capital (ΔNWC) is the difference between the current year's amount and the previous year's amount (Schmidlin, 2014). To calculate NWC, the relationship between the items composes of NWC and revenue is calculated. Each item is divided by revenue separately, and the weighted average of the ratios are used for estimating future values. The values used to calculate NWC with ratios are presented in the table 4.8 below.

Table 4.8 : NWC calculation for TOASO between 2016-2020 (in '000 TRY).

Items	2015	2016	2017	2018	2019	2020	Ratio (%)
AR	1.037.055	1.361.244	1.764.759	2.097.344	2.143.822	5.493.012	15.04
INV	548.251	920.144	1.055.582	1.076.671	749.130	1.523.966	5.61
AP	2.447.544	3.355.205	3.865.606	3.293.983	3.884.834	7.484.095	24.14
NWC	-862.238	-1.073.817	-1.045.265	-119.968	-991.882	-467.117	
ΔNWC		-211.579	28.552	925.297	-871.914	524.765	

4.1.1.7 Capital expenditure (CapEx)

CapEx is calculated by adding the increase in net PPE to depreciation, which is the remainder after subtracting the amount of PPE in the previous year from the current year's PPE amount. Therefore, to estimate CapEx, PPE amount is required, which is also used for estimating future CapEx. For instance, CapEx value in 2020 is calculated by adding the difference between the PPE values in 2020 and 2019 with D&A value in 2020. In the table 4.9, calculated CapEx values for each year for TOASO are presented.

Table 4.9 : CapEx for TOASO between 2016-2020 (in '000 TRY)

Year	PPE	D&A	CapEx
2020	2.037.483	399.691	324,954
2019	2.112.220	405.662	270,281
2018	2.247.601	417.817	315,399
2017	2.350.019	369.883	399,284
2016	2.320.618	276.432	485,530

4.1.2 Projecting future free cash flow

Forecasting starts with revenue projection. First, the current year's revenue value is multiplied by the calculated growth rate in the previous section and this process is repeated for the next 5 years, until 2025. After obtaining revenue values for each projected years, the other items are calculated based on these revenue values by using calculated key ratios. The calculations are presented in the table 4.10.

Table 4.10 : Projection of FCFF component for TOASO (in million TRY)

Items	2020A	2021E	2022E	2023E	2024E	2025E
Revenue	23,557	27,295	31,626	36,644	42,458	49,195
COGS	-20,440	-23,892	-27,683	-32,076	-37,165	-43,062
Gross Profit	3,117	3,403	3,943	4,568	5,293	6,133
S&M Expenses	-391	-481	-557	-645	-748	-866
G&A Expenses	-480	-546	-632	-732	-849	-983
R&D Expenses	-76	-90	-104	-121	-140	-162
Other Income from Operating Activities	1,381	2,195	2,543	2,947	3,415	3,956
Other Expense from Operating Activities	-1,582	-2,521	-2,920	-3,384	-3,921	-4,543
EBIT	1,970	1,961	2,273	2,633	3,051	3,535
PPE	2,037	3,046	3,530	4,090	4,739	5,491
D&A	400	565	654	758	879	1,018
NWC	-467	-953	-1,104	-1,279	-1,482	-1,717
AR	5,493	4,104	4,756	5,510	6,385	7,398
INV	1,524	1,531	1,773	2,055	2,381	2,759
AP	7,484	6,588	7,633	8,844	10,247	11,873
ΔNWC	525	-486	-151	-175	-203	-235
CapEx	325	1,574	1,138	1,318	1,527	1,770
FCFF	1,086	1,007	1,440	1,669	1,934	2,241

All required future financial items are calculated but one of the components needed in this model is tax rate. In Turkiye, tax rate defined in law in 2020 is 22% for the corporate earnings (Kurumlar Vergisi Kanunu, 2006). The rates specified in the law according to years are used in the paper and are shown in Table 4.11 on a yearly basis and according to this, tax rate used in this thesis is 22%.

Table 4.11 : Corporate tax rates between 2015 and 2020.

Accounting Period	Corporate Tax Rate
2020	22
2019	22
2018	22
2017	20
2016	20
2015	20

4.1.3 Determination of the discount rate

After estimating future cash flow that a company may create value for its stakeholders, it should be discounted with a proper rate to obtain the firm value. The most preferred method is WACC since it merges both k_d and k_e with the advantage of simplicity (Pereiro, 2002). The formula is shown in the equation (4.1) and determination of each item in the formula and the methods used in this thesis are given in the following section.

$$\text{WACC}=\left[\left(\frac{w_e}{w_e+w_d}\times k_e\right)+\left(\left(\frac{w_d}{w_e+w_d}\times k_d\right)\times(1-T)\right)\right] \qquad (4.1)$$

In formula, w_e and w_d are respectively stand for the weight of equity and debt and T is the tax-rate. Interest payments are treated as tax-deductible expenses, it allows lower the cost of debt financing than the cost of equity financing (Gitman, 2002). It should be noted that the weights and values are used in the formula should be based on the market value not the book value. The reason of it although the book value reveals the historical value, the market value reflects both asset in place and present value of future growth opportunities. Referring the formula above, the WACC for TOASO equals to 13,19% in 2020 as it can be seen below (4.2).

$$\text{WACC}_{\text{TOASO}}=\left[\left(\frac{0{,}3215}{1}\times 0{,}1944\right)+\left(\left(\frac{0{,}6785}{1}\times 0{,}1310\right)\times(1-0{,}22)\right)\right]=0{,}1319 \qquad (4.2)$$

4.1.3.1 The weights of debt (w_d) and equity (w_e)

In literature, there are several sources that show the weights of debt and equity can be calculated by considering the target rate of each industry that the company belongs (Pereiro, 2002; Goedhart et. al., 2005; Brigham and Houston, 2019; Pratt and Grabowski, 2014). The hypothesis behind this method is that the firm will ultimately

reach to industry averages. In this thesis, the target industry average debt/equity ratios are used.

To compute the target weights for debt and equity, firstly the cumulative balance sheets for each industry are downloaded from the database of Central Bank of the Republic of Turkiye (Sektör Bilançoları İstatistikleri, n.d.). There are 3 scale of the industry balance sheets are available, small, medium, and large. When the size of the firm in this thesis is considered, only the balance sheet that includes large-scale firms is used. In this point, the debt-to-equity ratios are calculated for each industry. According to the statistical classification of economic activities in the European Community (NACE), which is the classification of economic activities in the European Union (EU), the weights of reviewed company are matched with the industry average rates (*Glossary: Statistical Classification of Economic Activities in the European Community (NACE)*, 2016).

The first two decimals of NACE code for TOASO are 29 and the industry average rate is 2,11 in 2020 according to the analysis of the industry balance sheet. So, while calculating WACC in 2020, the w_d is 67,85% and w_e is 32,15% based on the computation stated in the table 4.12.

Table 4.12 : Computation of the weights of debt and equity for TOASO

Year	Debt Ratio	Equity Ratio	Average Debt to Equity Ratio
2009	0,5436	0,4564	1,1912
2010	0,5469	0,4531	1,2069
2011	0,5885	0,4115	1,4299
2012	0,5814	0,4186	1,3888
2013	0,6129	0,3871	1,5834
2014	0,6158	0,3842	1,6028
2015	0,6677	0,3323	2,0095
2016	0,6801	0,3199	2,1260
2017	0,6903	0,3097	2,2291
2018	0,6915	0,3085	2,2410
2019	0,6759	0,3241	2,0852
2020	0,6785	0,3215	2,1100

4.1.3.2 Cost of debt

Cost of debt is considered as the market value of the debts stated in financials. Although the values should be market value, some analysts use book value as a market value (Hitchner, 2011). For emerging markets, the cost of debt can be computed by

adding company default spread to the risk-free rate (r_f) (Kumar, 2016; Damodaran, 2012). The equation has two items, and these are explained in the following titles (4.3).

$$\text{cost of debt} = \text{risk-free rate}(\mathrm{r_f}) + \text{company default spread} \qquad (4.3)$$

4.1.3.3 Risk free rate

As Pratt and Grabowski defined, the risk-free rate (r_f) is the return available, as of the valuation date, on a security that the market generally regards as free of the risk of default (2014, p.91). Although the duration of bonds varies, the preferred one as the risk-free rate is 10-year zero-coupon treasury bond (Goedhart et al., 2010). Brotherson et al. (2013) show that 10 years treasury bill is also mostly preferred by the corporations and advisors. In this thesis, Turkish 10-year government bond return is used as r_f, which is 12.43%.

4.1.3.4 Company default spread

Some of the challenges have been raised while determining the cost of debt. If a firm has long-term bonds outstanding regularly, then the cost of debt can be calculated by using the yield and coupon payments, however it may not the case for other which do not trade regularly. If firms are rated by international agencies, then their cost of debt can be calculated considering their ratings and connected to company default spreads. On the other hand, companies may not prefer getting rated or rating agencies may not operate in some emerging markets. In case of the companies have not rated, there is an alternative way to assign their ratings based on their financial ratios, the method is called a synthetic rating (Damodaran, 2012). He also states that the interest coverage ratios are the key element while determining company default spread. The ratio is calculated by dividing EBIT by the total amount of interest expense on all the company's outstanding debts. The value obtained from the table can be used as the company default spread, in whichever range the result of the interest coverage ratio corresponds to in the table 4.13.

Table 4.13 : Ratings, interest coverage ratio and default spread

Greater than	≤ to	Rating is	Spread (%)
-100000	0,499999	D2/D	14.34
0,5	0,799999	C2/C	10.76
0,8	1,249999	Ca2/CC	8.80
1,25	1,499999	Caa/CCC	7.78
1,5	1,999999	B3/B-	4.62
2	2,499999	B2/B	3.78
2,5	2,999999	B1/B+	3.15
3	3,499999	Ba2/BB	2.15
3,5	3,999999	Ba1/BB+	1.93
4	4,499999	Baa2/BBB	1.59
4,5	5,999999	A3/A-	1.29
6	7,499999	A2/A	1.14
7,5	9,499999	A1/A+	1.03
9,5	12,499999	Aa2/AA	0.82
12,50	100	Aaa/AAA	0.67

By using the synthetic rating, the company default spread for TOASO is calculated 0,67% since its interest coverage ratio is computed 19,82% where EBIT is TRY 1.969.757.000 and the interest expense is TRY 104.225.

4.1.4 Cost of equity

Professor William Sharpe won Nobel Prize in 1990 because of his contributions to the theory of price development for financial assets, called Capital Asset Pricing Model (CAPM), which used Markowitz's model as a theory (*The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 1990*, n.d.). Fama and French (2004) also states that CAPM is widely used in application for estimating the cost of capital. Moreover, Brotherson et al. (2013) shows that it is most applied and preferred method in practice. The formula of CAPM is adding r_f to multiplied beta (β) and market risk premium (MRP), which is calculated by subtracting r_f from market return (r_m) (4.4).

$$k_e = r_f + \beta_i \times (r_m - r_f) \tag{4.4}$$

Beta (β) is the systematic risk of the equity and measures expected rate of return on a given security and risk. In theory, β equals the expected covariance $(cov(r_s, r_m))$ between the excess return on stock of a company (r_s) and the excess market return (r_m) divided by expected variance of excess return on overall stock market$(var(r_m))$ (Pratt & Grabowski, 2014). The calculation is presented in the equation 4.5.

$$\beta_i = \frac{cov(r_s, r_m)}{var(r_m)} \tag{4.5}$$

In this thesis, for each firm and period, β is computed in Microsoft Excel by using daily returns of the stocks and the market. BIST100 Index is selected to calculate market return. For each period, last 5 years returns are considered for both stock and market return. Additionally, the data used for risk-free rate is explained in the previous section and it is used while calculating CAPM.

4.1.5 Calculation of terminal value (TV)

The worth of the firm's predicted cash flow beyond the specified forecast horizon is known as terminal value. In fact, dividend projections are prepared for a certain number of years and shortening the forecast horizon usually demands calculating a terminal value or continuing value at the horizon. The valuation is frequently influenced by TV, so a high-quality estimate of TV is crucial since it accounts for a major amount of the firm's value. Companies that reinvest their profits should see higher rates of return. It will be tough for a company to continue its robust growth rate as it grows. According to the theory of a firm's life cycle, eventually, a high-growth firm matures and grows at a rate that is about equivalent to the growth rate of the economy in which it competes.

The value of all cash flows beyond the high growth period can be approximated as the firm's TV using the stable phase growth rate. The TV of a company can be calculated using the value based on the assumption of continued operation. The TV of the firm can be evaluated using DCF valuation or multiples from comparable firms based on ongoing concern. The Gordon growth model is used to determine the TV in DCF valuation (Kumar, 2016). The formula of calculating the TV is presented below (4.6):

$$Terminal\ Value = \frac{FCF_{i-horizon} \times (1 + g_c)}{(wacc - g_c)} \tag{4.6}$$

$FCF_{i-horizon}$ stands for the last calculated FCF at the end of the horizon, which is FCF_{2025}, and g_c stands for the constant growth rate that the company grows in the long run. WACC is the discount rate, and it is calculated previously and FCF_{2025} is also known. As Kumar (2016) states, the g_c cannot exceed the growth rate of the economy it operates in. According to the data extracted from Organization for

Economic Co-operation and Development (OECD), the average GDP of Turkey between 1971 and 2020 is calculated as 4,5 (*Growth in GDP per Capita, Productivity and ULC*, n.d.). So, the constant growth rate of Turkey is determined based on its past 50 years average growth rate, and it is also used as g_c for companies.

4.1.6 Valuation of TOASO

While calculating the value of the firm, first step is summing of all free cash flows which are discounted with a proper rate. The discount rate stands for WACC, and it is calculated 13.19% for TOASO in 2020 as it can be seen in table 4.14, so the current value of operations equals to TRY 19.835.932.768.

Table 4.14 : Discounted FCFF of TOASO in 2020

Year	2021E	2022E	2023E	2024E	2025E	TV
FCFF	1.006.710.651	1.440.473.481	1.669.040.018	1.933.874.257	2.240.730.960	26.538.980.299
Discount Factor	(1+0,1319)1	(1+0,1319)2	(1+0,11319)3	(1+0,1319)4	(1+0,1319)5	(1+0,1319)5
Present Value	889.432.537	1.124.402.921	1.151.043.659	1.178.315.603	1.206.233.707	14.286.504.339

Schmidlin (2014) argues that the value of the firm is not equal to the value of operations, the comprising debt should be considered as well as the fair value of shareholders' equity. Therefore, equity value equals to company value minus value of net debt positioning, which is the difference between the current value of non-operating assets and interest-bearing liabilities. Therefore, current value of equity for TOASO in 2020 is TRY 17.396.958.768 (4.7).

$$Equity\ value = 19.835.932.768\ + 4.250.811.000 - 6.689.785.000 \quad (4.7)$$

In 2020, TOASO has 500.000.000 shares outstanding and fair share price is calculated as TRY 34,78, however, realized share price in 31.12.2020 is TRY 28,45. To conclude, TOASO shares are 18,23% undervalued according to DCF valuation with various assumptions.

4.2 Valuation of Financial Service Firms with an Application to YKBNK

The Excess Return Model (ERM) is a valuation technique that assesses the worth of a company as the sum of capital invested in the firm today and the present value (PV) of dollar excess returns that the firm anticipates achieving in the future. The formulation of the model is presented below in equation 4.8.

$$ERM = Equity\ Capital\ Invested + PV\ of\ expecte\ excess\ return \quad (4.8)$$

According to the formulation, the model requires two inputs to value equity. The first is a measure of the firm's present equity capital. The present equity capital invested in a firm is often measured as the book value of the firm's equity. While book value of equity is an accounting measure that is influenced by accounting decisions, it should be a far more reliable estimate of equity invested in a financial services organization than in a manufacturing firm for two reasons.

First, the assets of a financial services organization are frequently financial assets that are marked up to market; the assets of manufacturing enterprises are actual assets with significantly wider book-to-market value variances. The second point to make is that depreciation, which can be a significant element in determining book value for manufacturing organizations, is frequently insignificant at financial service firms. Regardless, stock buybacks and one-time charges can have an impact on the book value of equities. The book value of equity for financial service firms that repurchase stock or take extraordinary charges may understate the firm's equity capital.

The predicted excess returns to stock investors in future periods are the second and more difficult element. Damodaran (2012) states that the focus on excess returns is the most intriguing part of this strategy. A company that invests its equity and earns only the fair-market rate of return on its investments should see the market value of its equity converge on the equity capital that is now invested in it. If a company obtains a sub-market return on its equity investments, its equity market value will fall below the amount of equity capital currently invested.

Another aspect worth mentioning is that this approach considers predicted future investments. Thus, it is up to the model's analyst to estimate not only where the financial services organization will focus its future investments, but also the returns on those investments. The excess returns in equity terms can be expressed as the return on equity (ROE) and the cost of equity, which is formulated below in 4.9:

$$ERM = (ROE - k_e) \times (equity\ capital\ invested) \quad (4.9)$$

4.2.1 Calculation of required inputs for ERM

This method does not require the analysis of historical values for all items like FCFF valuation, whereas cost of equity calculation is applied in the same way. The main inputs are beginning book value of equity, ending book value of equity, net income, equity cost, excess equity return and returned earnings. Moreover, k_e and ROE are the key ratios needed to compute main inputs. Calculation of each input and ratios are detailly explained in the following parts.

4.2.2 Return on equity (ROE) and net income

Return on equity is a profitability measurement of a firm from the perspective of equity investor by relating the equity investor's profits to the book value (BV) of the equity investment (Damodaran, 2012). The formula is presented in 4.10 below:

$$ROE = \frac{Net\ Income}{Book\ Value\ of\ Equity} \tag{4.10}$$

ROE is calculated for the last five years, and arithmetic average of the ratios are applied for the following years. In the table 4.15, the historical values are proposed, and ROE is computed 12.72%, which is used in the forecasted stage:

Table 4.15 : Historical ROE for YKBNK (in million TRY)

Items	2016	2017	2018	2019	2020
Beginning BV of Equity	23.086	26.121	30.102	39.007	41.192
Net Income	2.933	3.614	4.667	3.600	5.080
ROE	12.70%	13.84%	15.51%	9.23%	12.33%

To forecast net income, the beginning BV of equity is multiplied by ROE. The assumption is ROE remains the same in the forecasted period. The results are presented in the table 4.16 below:

Table 4.16 : Forecasted net income for YKBNK between 2021 and 2025

Items	2021E	2022E	2023E	2024E	2025E
Beginning BV of Equity	47,568,366,000	55,164,971,852	63,974,745,727	74,191,428,969	86,039,703,167
Net Income	6,051,379,113	7,017,776,444	8,138,506,167	9,438,214,960	10,945,485,548
ROE	12.72%	12.72%	12.72%	12.72%	12.72%

4.2.3 Cost of equity (k_e) and equity cost

CAPM is used to calculate k_e and the formulation is the same with the presented below. However, market return is recalculated based on the average return of the BIST 100 index and financial services index, which is 11.85%. Therefore, the cost of equity is calculated as 11.88%, and the details are presented in the table 4.17 below:

Table 4.17 : Cost of equity calculation for YKBNK

Items	Rates
r_f	12.43%
r_m	11.85%
β	0.94
k_e	11.88%

Equity cost is computed by multiplying the beginning book value of equity with k_e. The calculated values are presented in table 4.18 below:

Table 4.18 : Forecasted equity cost for YKBNK between 2021 and 2025

Items	2021E	2022E	2023E	2024E	2025E
Beginning BV of Equity	47,568,366,000	55,164,971,852	63,974,745,727	74,191,428,969	86,039,703,167
Equity Cost	5,651,327,985	6,553,837,675	7,600,476,982	8,814,263,218	10,221,889,529
k_e	11.88%	11.88%	11.88%	11.88%	11.88%

4.2.4 Retained earnings (RE)

Retained earnings are the total cumulative earnings the company has produced during its history less total cumulative dividend pay-outs. In this point, earnings have the similar economic drivers with expected return since total earnings equal to the total amount distributed to shareholders (Ball et al., 2019). The current retained earnings is the difference of the year-end book value and the beginning book value, TRY 6.4 billion. For the following years, RE to net income is kept the same. So, the rate is calculated by 125.54% and it is applied to the forecasting period. The calculations are introduced below in table 4.19:

Table 4.19 : Forecasted RE for YKBNK between 2021 and 2025 (in '000 TRY)

Items	2021E	2022E	2023E	2024E	2025E
Net Income	6,051,379	7,017,776	8,138,506	9,438,215	10,945,486
RE	7,596,606	8,809,774	10,216,683	11,848,274	13,740,428
RE/Net Income	125.54%	125.54%	125.54%	125.54%	125.54%

4.2.5 Excess equity return

In general definition, excess return is the return requested by investors to prefer equities rather than risk-free securities (Teglio et al., 2009). Thus, excess equity return is calculated as multiplying the beginning book value of equity by the difference between ROE and k_e. Since excess equity return is one of the main components of ERM, the present value of it needs to be calculated. The values are discounted by k_e. The forecasted excess returns and present values are shown in the table 4.20 below:

Table 4.20 : Excess return for YKBNK between 2021 and 2025

Items	2021E	2022E	2023E	2024E	2025E
Excess Return	400,051,127	463,938,769	538,029,184	623,951,741	723,596,019
k_e	11.88%	11.88%	11.88%	11.88%	11.88%
PV of Excess Return	357,570,234	370,640,085	384,187,663	398,230,430	412,786,486

4.2.6 Beginning and ending book value of equity

Accounting rules privileges that the previous year's ending book value of equity equals to the current year's beginning book value of equity. Therefore, for the consecutive years, this rule is applied. YKBNK had TRY 41 billion ending book value of equity in 2019, so it is used as beginning book value of equity in 2020. Moreover, ending book value is calculated by adding retained earnings to the beginning book value of equity. All forecasted inputs are presented in the table 4.21 below:

Table 4.21 : Input required to value YKBNK with ERM (in million TRY)

Items	2020A	2021E	2022E	2023E	2024E	2025E
Beginning BV of Equity	41,192	47,568	55,165	63,975	74,191	86,040
Net Income	5,080	6,051	7,018	8,139	9,438	10,945
Equity Cost	4,894	5,651	6,554	7,600	8,814	10,222
Excess Equity Return	186	400	464	538	624	724
Retained Earnings	6,377	7,597	8,810	10,217	11,848	13,740
Ending BV of Equity	47,568	55,165	63,975	74,191	86,040	99,780

4.2.7 Valuation of YKBNK

Fair value of share price equals to the sum of book value of equity invested currently and present value of excess return. Then, the total amount is divided by number of shares outstanding. As a result, the fair value is calculated as TRY 5.86 whereas the year end market value is TRY 2.93. To conclude, YKBNK shares are 50% undervalued according to ERM valuation with various assumptions. The calculations are presented in table 4.22 below:

Table 4.22 : Calculation of Fair Value of Equity for YKBNK

Items	TL
Book Value of Equity Invested Currently	47,568,366,000
PV of Equity Excess Return	1,923,414,899
Value of Equity	49,491,780,899
Total Number of Shares Outstanding	8,447,051,284
Fair Value of Equity	5.86

4.3 Valuation of Holdings Based On Revaluation of Their Subsidiaries in 2020

In this part, Koç Holding (KCHOL), Sabancı Holding (SAHOL), AG Anadolu Grubu Holding (AGHOL), Eczacıbaşı Yatırım Holding Ortaklığı (ECZYT) and Mazhar Zorlu Holding (MZHLD) are valued with SOTP technique in 2020. As per approach, the fair values of the subsidiaries applied to calculate the discount rates of holding companies and the results are discussed.

4.3.1 Results

In this part, the holdings total values are calculated from revaluation of their public traded subsidiaries for the five holding companies. Then, calculated fair value is compared with the market value of the holding in 2020.

First, Koç Holding's total value from the subsidiaries is TRY 86 billion and KCHOL has 2,5 billion shares. The fair value per share from the subsidiaries is TRY 33.80. Considering the stakeholder's equity of the holding, the contribution by its stakeholders is 50%. Therefore, the total value per share for the holding is calculated TRY 67.60. In 31.12.2020, the value of the holding is TRY 20.45 and comparing with the fair value KCHOL is discounted 70%, which is presented in the table 4.23.

Table 4.23 : Fair value of KCHOL

Firm	Number of Shares	Fair Value (TRY)	Ownership Rate	Fair Value
ARCLK	675,728,000	57.49	0.41	15,756,587,663
AYGZ	300,000,000	9.48	0.41	1,156,939,200
FROTO	350,910,000	131.30	0.39	17,807,787,680
MAALT	5,515,540	50.77	0.39	108,201,260
OTKAR	24,000,000	253.48	0.45	2,731,500,480
TATGD	136,000,000	11.26	0.44	671,041,952
TOASO	500,000,000	34.79	0.38	6,538,780,500
TUPRS	250,419,000	138.33	0.44	15,137,881,138
TTRAK	53,369,000	187.11	0.38	3,744,702,596
YKBNK	8,447,051,000	5.86	0.44	22,022,424,921
YKGYO	40,000,000	8.02	0.14	43,468,400
Total market value of the holding by public-traded subsidiaries				85,719,315,790
Total number of the holding's share				2,535,898,000
Fair value from public-traded subsidiaries				33.80
The percentage of public-traded subsidiaries				50%
Fair value of one share (TRY)				67.60
BIST value of one share (TRY)				20.45
Discount Rate				70%

Second, Sabancı Holding's total value from the subsidiaries is TRY 61 billion and SAHOL has 2 billion shares. The fair value per share from the subsidiaries is TRY 29.90. Considering the stakeholder's equity of the holding, the contribution by its stakeholders is 40%. Therefore, the total value per share for the holding is calculated TRY 73.92. In 31.12.2020, the value of the holding is TRY 10.55 and comparing with the fair value SAHOL is discounted 86%, presented in the table 4.24.

Table 4.24 : Fair value of SAHOL

Firm	Number of Shares	Fair Value (TRY)	Ownership Rate	Fair Value
AKBNK	8,447,051,284	13.84	0.41	47,637,358,646
AKCNS	191,447,070	12.06	0.40	917,075,881
KORDS	194,529,080	23.72	0.71	3,281,178,795
AVISA	180,000,000	8.54	0.40	614,880,000
BRISA	305,116,880	11.04	0.44	1,469,672,342
CRFSA	127,773,770	30.21	0.50	1,930,022,796
CIMSA	135,084,440	30.97	0.64	2,657,400,556
TKNSA	110,000,000	29.16	0.50	1,603,800,000
AKGRT	306,000,000	8.08	0.36	890,092,800
Total market value of the holding by public-traded subsidiaries				61,001,481,816
Total number of the holding's share				2,040,404,000
Fair value from public-traded subsidiaries				29.90
The percentage of public-traded subsidiaries				40%
Fair value of one share (TRY)				73.92
BIST value of one share (TRY)				10.55
Discount Rate				86%

Third, AG Anadolu Grubu Holding's total value from the subsidiaries is TRY 18 billion and it has 243 million shares. The fair value per share from the subsidiaries is TRY 75. Considering the stakeholder's equity of the holding, the contribution by its public-traded stakeholders is 53%. So, the total value per share for the holding is calculated TRY 141.03. In 2020, the value of the holding is TRY 26.12 and comparing with the fair value, AGHOL is discounted 81%, as presented in the table 4.25.

Table 4.25 : Fair value of AGHOL

Firm	Number of Shares	Fair Value (TRY)	Ownership Rate	Fair Value
ADEL	23,625,000	31.74	0.57	427,418,775
AEFES	592,105,000	37.63	0.43	9,580,791,795
ASUZU	84,000,000	11.52	0.55	532,224,000
CCOLA	254,371,000	68.00	0.22	3,805,390,160
MGROS	181,054,000	42.61	0.50	3,857,469,054
Total market value of the holding by public-traded subsidiaries				18.203.293.784
Total number of the holding's share				243,535,000
Fair value from public-traded subsidiaries				75
The percentage of public-traded subsidiaries				53%
Fair value of one share (TRY)				141,03
BIST value of one share (TRY)				26.12
Discount Rate				81%

Fourth, the total value from the subsidiaries for Eczacıbaşı Yatırım Holding is TRY 1.9 billion and ECZYT has 105 million shares. The fair value per share from the subsidiaries is TRY 18.23 and the contribution by its stakeholders is 56%. So, the value per share for the holding is TRY 32.55. In 2020, the value of the holding is TRY 27.74 and it is discounted 15%, which is presented in the table 4.26 below.

Table 4.26 : Fair value of ECZYT

Firm	Number of Shares	Fair Value (TRY)	Ownership Rate	Fair Value
ECILC	685,260,000	8.07	0.30	1,641,871,311
INTEM	19,440,000	30.3	0.46	272,191,687
Total market value of the holding by public-traded subsidiaries				1,914,062,998
Total number of the holding's share				105,000,000
Fair value from public-traded subsidiaries				18.23
The percentage of public-traded subsidiaries				56%
Fair value of one share (TRY)				32.55
BIST value of one share (TRY)				27.74
Discount Rate				15%

Lastly, the subsidiary of Mazhar Zorlu Holding, named EPLAS with 60% of the ownership rate, valued with FCFF. The total value is TRY 394 million where MZHLD has 11 million shares. The fair value per share from the subsidiary is TRY 36. Considering the stakeholder's equity of the holding, except 2020, the contribution by its stakeholder is 73%. The total value per share for the holding is calculated TRY 50.22. In 31.12.2020, the value of the holding is TRY 31.48 and comparing with the fair value MZHLD is discounted 34% (Table 4.27).

Table 4.27 : Fair value of MZHLD

Firm	Number of Shares	Fair Value (TRY)	Ownership Rate	Fair Value
EPLAS	20,000,000	32.99	0.60	394,494,420
Total market value of the holding by public-traded subsidiaries				394,494,420
Total number of the holding's share				10,836,000
Fair value from public-traded subsidiaries				36
The percentage of public-traded subsidiaries				73%
Fair value of one share (TRY)				50.22
BIST value of one share (TRY)				31.48
Discount Rate				37%

4.3.2 Discussion of the Results

This thesis investigates whether Turkish Holding companies are discounted in the stock market similar to USA and Korean stock markets. Also, if it is the case, the rate of discount is measured. In this point, Koç Holding (KCHOL), Sabancı Holding (SAHOL), AG Anadolu Grubu Holding (AGHOL), Eczacıbaşı Yatırım Holding Ortaklığı (ECZYT) and Mazhar Zorlu Holding (MZHLD) are valued and discount rate of holding companies are calculated. These holding companies constitute 67% of total market cap of XHOLD in 31.12.2020 and the discount rates are presented in the table 4.28 below.

Table 4.28 : Fair Values of the Holdings by Valuing the Subsidiaries

Holding Name	Market Value (TL)	Fair Value (TL)	Discount Rate	% Of public-traded subsidiaries	Market Cap (in million TL)	% Of XHOLD
KCHOL	20.45	67.60	70%	50%	53,558,167	41.23
SAHOL	10.55	73.92	86%	40%	23,383,029	18.00
AGHOL	26.12	141.03	81%	53%	6,434,182	4.95
ECZYT	27.74	32.55	15%	56%	2,912,700	2.24
MZHLD	31.48	50.22	37%	73%	341,117	0.26

As it is presented in the table, KCHOL accounts for 41% of the total index and the holding is discounted by 70%. Also, SAHOL is 18% of the index and it is discounted by 86%. Further, the other holding company AGHOL is 5% of the index and it is discounted by is discounted 81%, similarly. These three holdings consist 64% of the total index and these are discounted 70%-86%. On the other hand, ECZYT and MZHLD are discounted with 15% and 37% respectively. These holdings have one or two public-traded subsidiaries, and these holdings consist only 2.5% of the total index.

As a result, this study shows that holding companies in Turkiye are discounted between 15% and 87%, whereas the majority of the index is discounted between 60% and 86%. When these rates are taken into consideration, the holdings are discounted at similar rates with the holdings in South Korea.

4.4 Valuation of Holdings Based on the Market Values of the Subsidiaries in Time Series

Until this part of the thesis, the values of holdings' subsidiaries are calculated by either FCFF or ERM under several assumptions to evaluate the value of five holding companies in 2020. In this part, values of the seventeen holdings are calculated from the market values of their subsidiaries. Since there is no need for valuation of holding's subsidiaries, then the calculations are repeated between 2011 and 2020 to understand if the discounts still exist for the whole period. The ownership rates of the holding companies for their subsidiaries are kept the same, which are calculated by stakeholders' value.

In the first step, the market values of a holding's subsidiaries are noted between 2011 and 2020 and the values are multiplied by the holding's ownership rates and the subsidiaries' total number of shares respectively. The results are divided by the holding's total number of shares to find the values from public-traded subsidiaries yearly basis. It is also assumed that non-publicly traded companies have the same performance with public-traded subsidiaries same as the previous part. Accordingly, fair values of the holding are calculated, and the results are compared with the market values. The calculations applied to all seventeen holding companies and are explained under respective sub-headings.

4.4.1 Results

Fair value of one holding' share is derived from its public-traded subsidiaries' market values, equals to the value of the last day of each year. As a result of calculation, positive discount rate indicates that holding is traded with discount. On the contrary, if the discount rate is negative, so it is not a discount but traded with overvalue.

First, Koç Holding A.Ş. has the same number of shares outstanding except 2011 and the percentages of public-traded subsidiaries vary in the period. Its discount rates are between 28% and 62% with an average of 39%. The result obtained in 2020 is the highest value of the last ten years and there is no clear trend. Although considering the current year's discount rate may be misleading as an outlier, it is the obvious that the holding has been traded with discount. The details are presented in the table 4.29.

Table 4.29 : Time Series of KCHOL with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	60.233.360.782	2.535.898.000	23,75	44%	54,12	20,45	62%
2019	42.217.828.711	2.535.898.000	16,65	60%	27,91	19,38	31%
2018	30.091.217.711	2.535.898.000	11,87	56%	21,35	13,21	38%
2017	37.643.521.103	2.535.898.000	14,84	53%	28,11	16,82	40%
2016	23.139.441.940	2.535.898.000	9,12	52%	17,44	12,31	29%
2015	18.780.969.034	2.535.898.000	7,41	50%	14,74	9,55	35%
2014	18.717.292.386	2.535.898.000	7,38	50%	14,85	10,66	28%
2013	14.691.600.777	2.535.898.000	5,79	49%	11,72	7,47	36%
2012	15.022.891.595	2.535.898.000	5,92	45%	13,26	7,82	41%
2011	8.987.995.447	2.415.141.000	3,72	44%	8,46	4,55	46%

Second, Sabancı Holding has the same number of shares and the discount rates are between 49% and 78% with the average 64%. For the last five years, the discount rates are above 71%. The details of the calculations are presented in the table 4.30 below.

Table 4.30 : Time Series of SAHOL with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	33.058.455.324	2.040.404.000	16,20	44%	36,90	10,55	71%
2019	34.108.347.578	2.040.404.000	16,72	43%	38,50	8,40	78%
2018	21.615.770.540	2.040.404.000	10,59	43%	24,73	6,37	74%
2017	27.900.424.147	2.040.404.000	13,67	43%	31,50	9,15	71%
2016	28.084.770.088	2.040.404.000	13,76	47%	29,46	7,38	75%
2015	13.975.916.291	2.040.404.000	6,85	48%	14,29	6,57	54%
2014	14.227.098.486	2.040.404.000	6,97	38%	18,51	7,97	57%
2013	10.752.436.876	2.040.404.000	5,27	38%	13,92	7,04	49%
2012	12.885.186.253	2.040.404.000	6,32	39%	16,08	7,97	50%
2011	8.258.925.730	2.040.404.000	4,05	39%	10,35	4,48	57%

Third, AG Anadolu Grubu A.G. were established in 2017 as it was mentioned before. Therefore, the values are available since this year. In the period, the amounts of the holding's shares are the same and the percentage of public-traded subsidiaries are so close to each other. On the other hand, the discount rates are between 70% and 83% with an average of 77%. Although there is no data available to consider the existence of any trend, as a result, the holding is traded with discount. The details of the calculation are presented in the table 4.31.

Table 4.31 : Time Series of AGHOL with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	14.111.100.831	243.535.000	57,94	53%	109,95	26,12	76%
2019	9.974.348.985	243.535.000	40,96	53%	77,34	17,39	78%
2018	7.654.844.225	243.535.000	31,43	52%	60,23	10,02	83%
2017	9.757.741.112	243.535.000	40,07	53%	75,74	23,09	70%

Fourth, Eczacıbaşı Yatırım Holding A.Ş. increased the number of shares outstanding in 2016 and historically, the percentages of public-traded subsidiaries are above 40%. The discount rates are between 6% and 40% with an average of 26%. The current year's rate is less than the average and the lowest value in the last five year. Although there is no trend, the holding is traded with discount for the last ten years with variety of rates. The details are presented in the table 4.32 below.

Table 4.32 : Time Series of ECZYT with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	1.876.195.195	105.000.000	17,87	56%	32,19	27,74	14%
2019	825.413.811	105.000.000	7,86	55%	14,30	9,63	33%
2018	498.725.125	105.000.000	4,75	56%	8,51	6,10	28%
2017	753.667.787	105.000.000	7,18	55%	13,03	8,50	35%
2016	472.934.846	105.000.000	4,50	63%	7,16	6,18	14%
2015	146.172.947	70.000.000	2,09	42%	4,93	4,65	6%
2014	125.440.623	70.000.000	1,79	42%	4,26	2,67	37%
2013	108.578.096	70.000.000	1,55	45%	3,45	2,18	37%
2012	100.400.300	70.000.000	1,43	44%	3,24	2,58	20%
2011	86.569.975	70.000.000	1,24	46%	2,71	1,64	40%

Fifth, the discounts are between 44% and 70% with the average 55% for Mazhar Zorlu Holding. The percentage of public-traded subsidiary is the lowest value of the period. On the other hand, the discount rate is equals to the average, but not the lowest as well. The details are listed in the table 4.33.

Table 4.33 : Time Series of MZHLD with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	398.201.400	10.836.000	36,75	53%	69,47	31,48	55%
2019	179.050.000	10.836.000	16,52	70%	23,47	12,09	48%
2018	55.004.160	10.836.000	5,08	71%	7,16	3,81	47%
2017	67.036.320	10.836.000	6,19	70%	8,79	3,99	55%
2016	27.931.800	10.836.000	2,58	73%	3,54	1,17	67%
2015	26.499.400	10.836.000	2,45	73%	3,35	1,02	70%
2014	17.188.800	10.836.000	1,59	74%	2,16	1,11	49%
2013	14.324.000	10.836.000	1,32	74%	1,79	0,77	57%
2012	24.442.600	10.836.000	2,26	74%	3,03	1,26	58%
2011	7.045.220	10.836.000	0,65	75%	0,87	0,49	44%

Sixth, Ittifak Holding A.Ş. has one publicly traded subsidiary, Adese Gayrimenkul Yatırım A.Ş. (ADESE). The holding and the subsidiary have increased its total number of shares three times in this period. Until 2018, public-traded subsidiary could provide reliable estimation of the holding's value with an average of 78%. Considering the last two years value, the subsidiary is not sufficient to provide reliable estimation of the holding. Overall, holding has been traded with discount between 20% and 89% with an average of 60%. The details are available in the table 4.34 below.

Table 4.34 : Time Series of ITTFH with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	43.200.062	384.000.000	0,11	4%	2,80	2,23	20%
2019	10.893.767	90.000.000	0,12	5%	2,28	1,27	44%
2018	134.057.557	60.000.000	2,23	62%	3,59	0,71	80%
2017	114.006.241	60.000.000	1,90	66%	2,89	0,53	82%
2016	103.121.184	60.000.000	1,72	67%	2,56	0,41	84%
2015	115.317.920	60.000.000	1,92	89%	2,15	0,49	77%
2014	268.239.473	60.000.000	4,47	96%	4,63	0,52	89%
2013	46.397.310	60.000.000	0,77	76%	1,02	0,39	62%
2012	20.070.066	30.000.000	0,67	91%	0,73	0,59	20%
2011	20.534.412	30.000.000	0,68	77%	0,89	0,52	42%

Seventh, Ihlas Yayın Holding A.S (IHYAY) has one public-traded subsidiary, called Ihlas Gazetecilik A.Ş. (IHGZT). Currently, the public-traded subsidiary is 25% of the shareholder's equity value of the holding. So, it is not sufficient to provide reliable

estimation of the holding value as a whole. Also, the discount rate is negative until 2019. It means that the fair value of the holding is less than the market value of it.

Since the negative discount rates are relatively extremely small, the potential reasons are investigated. First, independent audit reports of the period are reviewed to check whether financial statements have indications. However, there are no special case of impairment observed in the report. Second, online news was reviewed on Google searching engine and no news found to explain the overvaluation of the holding. Third, the history of the holding is reviewed. According to the Ihlas Yayın Holding A.S Activity Report (2011), the initial public offering of the holding was held in November 2010 and the initial public offering of its subsidiary Ihlas Gazetecilik A.Ş. was held in June 2010. Therefore, the investors may not have enough historical data to evaluate the holding's fair value. Moreover, since both fair values per share and market values are relatively so small, then the smallest change in estimation may have greater impact. The fair values and the market values are provided in the table 4.35 below.

Table 4.35 : Time Series of IHYAY with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	215.506.805	450.000.000	0,48	25%	1,90	1,14	40%
2019	164.623.920	200.000.000	0,82	60%	1,38	0,83	39%
2018	14.213.030	200.000.000	0,07	52%	0,14	0,27	-98%
2017	32.076.442	200.000.000	0,16	61%	0,27	0,42	-57%
2016	14.135.386	200.000.000	0,07	59%	0,12	0,19	-56%
2015	11.960.726	200.000.000	0,06	56%	0,11	0,20	-84%
2014	12.776.198	200.000.000	0,06	55%	0,12	0,25	-110%
2013	14.649.600	200.000.000	0,07	48%	0,15	0,66	-334%
2012	28.560.000	200.000.000	0,14	46%	0,31	1,14	-270%
2011	17.191.200	200.000.000	0,09	42%	0,20	0,83	-307%

Eight, Doğan Şirketler Grubu Holding A.S (DOHOL) has four publicly traded subsidiaries; Çelik Halat ve Tel Sanayi A.s (CELHA), Ditaş Doğan Yedek Parça İmalat ve Teknik A.S (DITAS), Doğan Burda Dergi Yayıncılık ve Pazarlama A.S (DOBUR) and Milpa Ticari ve Sinai Urunler Pazarlama Sanayi ve Ticaret A.S (MIPAZ). All of them are traded actively between 2011 and 2020. However, the average of the percentage of public-traded subsidiaries is 4%. Therefore, the subsidiaries do not provide reliable estimation for valuation of the holding. As a result

of valuation, the holding has been traded with discount between 73% and 94% with the average 82%. The details are provided in the table 4.36.

Table 4.36 : Time Series of DOHOL with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	4.040.647.955	2.616.938.000	1,54	3%	50,56	3,00	94%
2019	1.124.978.102	2.616.938.000	0,43	4%	12,03	1,75	85%
2018	491.719.772	2.616.938.000	0,19	3%	6,67	0,89	87%
2017	550.782.128	2.616.938.000	0,21	7%	3,20	0,76	76%
2016	484.785.589	2.616.938.000	0,19	7%	2,81	0,66	76%
2015	329.706.165	2.616.938.000	0,13	5%	2,32	0,50	79%
2014	336.044.071	2.616.938.000	0,13	5%	2,44	0,66	73%
2013	350.930.329	2.450.000.000	0,14	4%	4,07	0,63	85%
2012	292.445.923	2.450.000.000	0,12	3%	4,56	0,80	82%
2011	211.401.172	2.450.000.000	0,09	3%	2,52	0,47	81%

Nineth, Tekfen Holding A.S (TKFEN) has four public-traded subsidiaries; Akmerkez Gayrimenkul Yatırım Ortaklığı A.S (AKGMY), Akçansa Çimento Sanayi ve Ticaret A.S (AKCNS), Turcas Petrol A.S (TURCS) and Turkiye Sınai Kalkınma Bankası A.S (TSKB). Since the average of the percentage of public-traded subsidiaries is 3%, the subsidiaries do not provide reliable estimation for valuation of the holding. Moreover, the holding is overvalued in 2017 and 2018 whereas it is traded with discount for the rest of the years. There is no trend or consistent rates. The details are provided in the table 4.37 below.

Table 4.37 : Time Series of TKFEN with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	320.710.397	370.000.000	0,87	2%	49,30	15,91	68%
2019	139.582.199	370.000.000	0,38	2%	21,99	17,79	19%
2018	87.275.472	370.000.000	0,24	2%	12,07	18,07	-50%
2017	107.711.462	370.000.000	0,29	3%	10,92	14,29	-31%
2016	94.541.470	370.000.000	0,26	3%	8,16	5,23	36%
2015	73.022.895	370.000.000	0,20	3%	5,84	3,19	45%
2014	70.602.406	370.000.000	0,19	3%	5,83	4,47	23%
2013	58.943.587	370.000.000	0,16	3%	5,27	3,99	24%
2012	70.733.879	370.000.000	0,19	3%	7,38	5,53	25%
2011	47.398.808	370.000.000	0,13	3%	5,04	4,01	20%

Tenth, Alarko Holding A.S (ALARK) has two public-traded subsidiaries; Alarko Carrier Sanayi ve Ticaret A.Ş. (ALCAR) and Alarko Gayrimenkul Yatırım Ortaklığı A.Ş. (ALGYO). The historical average of the percentage of public-traded subsidiaries is 35%. When the fair values are compared with the market values, the holding is overvalued between 2017 and 2019. For the rest of the period, it is traded with discount but there is no trend or consistency. The details are listed in the table 4.38 below.

Table 4.38 : Time Series of ALARK with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	2.489.088.438	435.000.000	5,72	39%	14,71	8,52	42%
2019	350.789.207	435.000.000	0,81	47%	1,71	5,79	-239%
2018	215.541.190	435.000.000	0,50	46%	1,07	1,90	-78%
2017	302.480.332	223.467.000	1,35	42%	3,20	3,22	-1%
2016	184.101.082	223.467.000	0,82	38%	2,15	1,82	15%
2015	145.286.081	223.467.000	0,65	37%	1,78	1,19	33%
2014	139.326.603	223.467.000	0,62	29%	2,16	1,72	21%
2013	107.651.319	223.467.000	0,48	25%	1,91	1,77	7%
2012	151.908.350	223.467.000	0,68	25%	2,71	1,99	27%
2011	117.500.494	223.467.000	0,53	22%	2,38	1,14	52%

Eleventh, Verusa Holding A.S (VERUS) has two public-traded subsidiaries; Acıselsan Acıpayam Selüloz Sanayi ve Ticaret A.S (ACSEL) and Verusaturk Girişim Sermayesi Yatırım Ortaklığı A.S (VERTU). The holding does not have public-traded subsidiaries before 2015. Therefore, the analysis is done between 2015 and 2020. The ratios show that the company is overvalued for this period between 26% and 688% with averagely 253%. The details are presented in the table 4.39 below.

Table 4.39 : Time Series of VERUS with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	574.881.926	70.000.000	8,21	48%	17,09	45,08	-164%
2019	217.952.010	70.000.000	3,11	35%	8,79	18,54	-111%
2018	118.381.147	70.000.000	1,69	37%	4,52	16,55	-266%
2017	77.566.476	70.000.000	1,11	37%	2,97	22,84	-668%
2016	103.293.442	70.000.000	1,48	40%	3,73	14,38	-285%
2015	95.712.452	20.000.000	4,79	42%	11,46	14,41	-26%

Twelfth, Net Holding A.S (NTHOL) has one public-traded subsidiary, Merit Turizm Yatırım ve İşletme A.S (MERIT). The market value of the subsidiary is not available,

so the analysis is done from 2012. The subsidiary cannot provide reliable estimation of the value of the holding since the percentage of public-traded subsidiary is averagely 0.5% and the fair values from the subsidiaries per share is less than TRY 1. Nevertheless, the fair values are compared with the market values and the holding has been traded with discount between 26% and 90%. The details are listed in the table 4.40 below.

Table 4.40 : Time Series of NTHOL with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	110.537.987	563.875.940	0,20	0,6%	33,41	3,43	90%
2019	29.212.780	563.875.940	0,05	0,6%	8,74	2,60	70%
2018	9.001.263	563.875.940	0,02	0,6%	2,68	1,96	27%
2017	8.850.991	563.875.940	0,02	0,3%	4,65	2,21	52%
2016	5.584.079	365.750.000	0,02	0,3%	4,71	3,06	35%
2015	6.235.676	365.750.000	0,02	0,3%	5,86	3,77	36%
2014	8.109.112	365.750.000	0,02	0,4%	5,76	4,29	26%
2013	8.507.208	365.750.000	0,02	0,4%	5,45	2,65	51%
2012	9.951.375	365.750.000	0,03	0,7%	4,17	1,84	56%

Thirteenth, Global Yatırım Holding A.S (GLYHO) has two public-traded subsidiaries, Global Menkul Değerler A.S (GLBMD) and Pera Gayrimenkul Yatırım Ortaklığı A.S (PEGYO). There is no available market value for GLBMD in 2011. So, the fair value is derived from PEGYO only for this year. When the fair values are compared with the market values, the holding is overvalued for the five years besides, it is traded with discount for the others. The details are presented in the table 4.41 below.

Table 4.41 : Time Series of GLYHO with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	193.394.913	325.888.410	0,59	4%	15,89	3,51	78%
2019	71.371.388	325.888.410	0,22	4%	6,10	3,66	40%
2018	36.167.329	325.888.410	0,11	4%	2,58	2,24	13%
2017	45.146.674	325.888.410	0,14	5%	2,66	2,71	-2%
2016	25.335.945	193.500.000	0,13	12%	1,12	1,21	-8%
2015	29.317.389	193.500.000	0,15	12%	1,31	1,24	6%
2014	29.984.735	204.211.920	0,15	15%	0,98	1,02	-5%
2013	28.535.942	225.003.690	0,13	16%	0,82	0,89	-8%
2012	40.305.832	225.003.690	0,18	16%	1,11	0,87	22%
2011	20.733.303	225.003.690	0,09	18%	0,52	0,82	-58%

Fourteenth, GSD Holding A.S (GSDHO) has one public-traded subsidiary, GSD Denizcilik Gayrimenkul İnşaat Sanayi ve Ticaret A.S (GSDDE). Averagely, 7% of the holding value can be derived from its subsidiary and the holding has been traded with discount between 6% and 84% except 2018. The holding is overvalued by 17% in 2018. The details of the calculations are presented in the table 4.42 below.

Table 4.42 : Time Series of GSDHO with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	60.065.852	450.000.000	0,13	5%	2,91	2,51	14%
2019	53.835.614	450.000.000	0,12	8%	1,57	1,42	9%
2018	24.183.945	450.000.000	0,05	8%	0,65	0,76	-17%
2017	28.046.091	450.000.000	0,06	8%	0,78	0,69	12%
2016	21.621.014	450.000.000	0,05	9%	0,56	0,53	6%
2015	21.424.447	250.000.000	0,09	9%	0,93	0,44	52%
2014	26.759.205	250.000.000	0,11	9%	1,15	0,52	55%
2013	5.292.540	250.000.000	0,02	5%	0,47	0,15	68%
2012	6.795.360	250.000.000	0,03	5%	0,60	0,13	79%
2011	6.860.700	250.000.000	0,03	5%	0,56	0,09	84%

Fifteenth, Ihlas Holding A.S (IHLAS) has four public-traded subsidiaries; İhlas Ev Aletleri İmalat Sanayi ve Ticaret A.S (IHEVA), Ihlas Gayrimenkul Proje Geliştirme ve Ticaret A.S (IHLGM), İhlas Gazetecilik A.S (IHGZT) and IHYAY. The percentage of public-traded subsidiaries averagely 33% and the holding is overvalued for five years between 2014 and 2018. The other years, it is traded with discount with variety of rates. The details of the calculations are presented in the table 4.43 below.

Table 4.43 : Time Series of IHLAS with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	642.538.851	1.500.000.000	0,43	24%	1,77	1,12	37%
2019	784.072.173	790.400.000	0,99	35%	2,81	0,82	71%
2018	63.150.519	790.400.000	0,08	31%	0,26	0,29	-11%
2017	110.307.073	790.400.000	0,14	32%	0,44	0,48	-10%
2016	44.154.768	790.400.000	0,06	33%	0,17	0,27	-61%
2015	44.418.493	790.400.000	0,06	36%	0,15	0,20	-29%
2014	60.632.754	790.400.000	0,08	36%	0,21	0,28	-33%
2013	241.223.771	790.400.000	0,31	39%	0,79	0,42	47%
2012	284.161.546	790.400.000	0,36	30%	1,20	1,15	4%
2011	201.920.346	790.400.000	0,26	30%	0,84	0,71	16%

Sixteenth, Metro Holding A.S (METRO) has two public-traded subsidiaries; Mepet Metro Petrol ve Tesisleri Sanayi Ticaret A.S (MEPET) and Vanet Gıda Sanayi İç Ve Dış Ticaret A.S (VANGD). The percentage of public-traded subsidiaries is averagely 19% and the holding is traded with discount between 18% and 95%.The calculations are presented in the table 4.44 below.

Table 4.44 : Time Series of METRO with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	192.826.453	300.000.000	0,64	10%	6,24	1,87	70%
2019	88.043.672	300.000.000	0,29	14%	2,09	1,24	41%
2018	55.754.740	300.000.000	0,19	18%	1,05	0,68	35%
2017	155.768.351	300.000.000	0,52	9%	5,49	0,89	84%
2016	195.775.670	300.000.000	0,65	12%	5,26	0,81	85%
2015	164.889.065	300.000.000	0,55	13%	4,37	0,60	86%
2014	508.621.437	300.000.000	1,70	13%	12,91	0,59	95%
2013	222.763.180	300.000.000	0,74	34%	2,21	0,77	65%
2012	50.591.201	300.000.000	0,17	29%	0,57	0,47	18%
2011	143.285.750	300.000.000	0,48	41%	1,17	0,92	21%

Lastly, Işıklar Enerji ve Yapı Holding A.S (IEYHO) has two public-traded subsidiaries; Niğbaş Niğde Beton Sanayi ve Ticaret A.Ş. (NIBAS) and Çemaş Döküm Sanayi A.S (CEMAS). The subsidiaries have no market value before 2014 and they do not provide reliable estimation of the holding. The fair values are compared with the market values and the holding has been traded with discount between 49% and 95%. The details are provided in the table 4.45 below.

Table 4.45 : Time Series of IEYHO with Discount Rates

Year	Total Value from Public-Traded Subsidiaries (TRY)	Holding's shares	Fair Value from Subsidiaries (TRY)	% of public-traded subsidiaries	Fair value of one share (TRY)	Market value of one share (TRY)	Discount Rate
2020	1.325.376.000	543.595.730	2,44	10%	24,56	1,14	95%
2019	173.392.920	543.595.730	0,32	17%	1,86	0,62	67%
2018	95.752.800	543.595.730	0,18	11%	1,65	0,84	49%
2017	192.369.283	543.595.730	0,35	38%	0,92	0,40	57%
2016	161.398.407	286.121.260	0,56	29%	1,97	0,28	86%
2015	77.741.204	286.121.260	0,27	33%	0,82	0,27	67%
2014	90.327.561	286.121.260	0,32	44%	0,71	0,34	52%

4.4.2 Discussion of the Results

Seventeen holding companies are valued by applying SOTP methodology, which considers the value of the holding can be derived from their subsidiaries. Therefore, market values of the subsidiaries are used to calculate the holdings' values with the assumption of non-public-traded subsidiaries perform in parallel to the publicly traded subsidiaries. It should be remembered that if public-traded companies compose of the insignificant part of the holding, then they may not be sufficient to reflect the fair of the holding.

KCHOL, AGHOL, ECZYT and MZHLD are the holding companies that have public-traded subsidiaries can provide reliable estimation in the period with above 40%. SAHOL has had 38% or 39% public-traded subsidiary rate between 2011 and 2014, but after it also has more than 40%. Moreover, ITTFH has had 4% and 5% of public-traded subsidiaries for the last two years beside it has had above 62%. It is also similar for IHYAY, which has 25% whereas it has had more than 42% for the rest of the period. Further, GSDHO, NTHOL, DOHOL and TKFEN are the holding companies have less than 10% of public-traded subsidiaries as representative. The others have above 10% at least for a year.

In most cases, holding companies are traded at a discount between 2011 and 2020, either for certain years or completely. Nevertheless, there is no holding company which is overvalued as a result of the calculations through the whole period except VERUS. For the holdings having at least 40% of public-traded representativeness, KCHOL, SAHOL, AGHOL, ECZYT and MZHLD, have different discount rates and there is not direct relation between the percentages of public-traded companies and holdings' fair values. The fair values and the market values between 2011 and 2020 are presented in the table 4.46 below.

KCHOL and SAHOL are the same companies valued by Kuloglu and studied in this study. According to his results, KCHOL is traded with discount by 17% and SAHOL is traded with discount by 15% in 2017 whereas our study finds that KCHOL is discounted by 40% and SAHOL is discounted by 71% in 2017 when the values are derived from the market values of their subsidiaries. Kuloglu's results are in parallel to the USA holdings companies whereas the results presented in this thesis are similar

to Korean holding companies. The time series for seventeen holding companies are listed in the table 4.46 with details below.

Table 4.46 : Time Series of Seventeen Holding Companies with Discount Rates

Holdings	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
KCHOL	62%	31%	38%	40%	29%	35%	28%	36%	41%	46%
SAHOL	71%	78%	74%	71%	75%	54%	57%	49%	50%	57%
AGHOL	76%	78%	83%	70%						
ECZYT	14%	33%	28%	35%	14%	6%	37%	37%	20%	40%
MZHLD	55%	48%	47%	55%	67%	70%	49%	57%	58%	44%
ITTFH	20%	44%	80%	82%	84%	77%	89%	62%	20%	42%
IHYAY	40%	39%	-98%	-57%	-56%	-84%	-110%	-334%	-270%	-307%
DOHOL	94%	85%	87%	76%	76%	79%	73%	85%	82%	81%
TKFEN	68%	19%	-50%	-31%	36%	45%	23%	24%	25%	20%
ALARK	42%	-239%	-78%	-1%	15%	33%	21%	7%	27%	52%
VERUS	-164%	-111%	-266%	-668%	-285%	-26%				
NTHOL	90%	70%	27%	52%	35%	36%	26%	51%	56%	
GLYHO	78%	40%	13%	-2%	-8%	6%	-5%	-8%	22%	-58%
GSDHO	14%	9%	-17%	12%	6%	52%	55%	68%	79%	84%
IHLAS	37%	71%	-11%	-10%	-61%	-29%	-33%	47%	4%	16%
METRO	70%	41%	35%	84%	85%	86%	95%	65%	18%	21%
IEYHO	95%	67%	49%	57%	86%	67%	52%			

4.5 Evaluation of the Results

In chapter four, two different approaches are applied. Firstly, the fair values of the holdings are calculated in 2020 by their public-traded subsidiaries, which are also fairly valued. The fair values are compared with their market values to understand whether the holdings are traded with discount or not. In this approach, it is pre-acceptance that public-traded subsidiaries should provide reliable estimation and the rate of the public-traded subsidiaries are set up as 40% as minimum. Therefore, the fair value of only five holding companies, which can meet this, and other certain criteria are calculated. As a result, the holdings are traded with discount in 2020 with different percentages.

Secondly, the fair values of the seventeen holdings are calculated between 2011 and 2020 by the market values of their public-traded subsidiaries. In this approach, the aim is to understand if the holdings are traded with discount over the period. Also, since the market values are used while valuation of the holdings, less assumptions are needed. In this approach, some holding companies are valued even though these does not have sufficient rate of public-traded companies for reliable estimation.

Consequently, there are three values available for the five holding companies in 2020: the fair values from valuation of the subsidiaries, the fair values from the market values of the subsidiaries and the market values. As a result, in the second approach, the holdings are traded with less discount compared to the first approach except MZHLD, which is the only holding having one public-traded subsidiary. For the others, the reason might be due to the possibility that the subsidiaries are also traded with discount. Both approaches show that holdings are discounted, and the ratios are similar to the Korean holding companies rather than the USA holding companies. The fair values from valuation of the subsidiaries, the fair values from the market values of the subsidiaries and the market values are presented in the table 4.47 below.

Table 4.47 : Comparison of Three Prices for Five Holding Companies

Holding Names	Market Values (TRY)	Fair Values from valuation of their subsidiaries (TRY)	Discount Rate	Fair Values from the market values of subsidiaries (TL)	Discount Rates	% Of public-traded subsidiaries	Market Caps (in million TL)	% Of XHOLD
KCHOL	20.45	67.60	70%	54,12	62%	50%	53,558,167	41.23
SAHOL	10.55	73.92	86%	36,90	71%	40%	23,383,029	18.00
AGHOL	26.12	141.03	81%	109,95	76%	53%	6,434,182	4.95
ECZYT	27.74	32.55	15%	27,74	14%	56%	2,912,700	2.24
MZHLD	31.48	50.22	37%	31,48	55%	73%	341,117	0.26

5. CONCLUSION

As an organizational structure, holdings have been established as a result of the development of the businesses' operations and growth around 1900s in the world. These organizations have been recognised especially after 1960s in Turkiye. In the literature, holding companies are valued with discount, which varies according to the countries. For instance, holdings in the USA are valued with 10-15% discount, the ratio is between 30-60% in South Korea stock market. On the other hand, there is very limited research in the literature regarding valuation of holding companies listed on Borsa Istanbul (BIST).

This thesis studies on the Turkish holding companies to investigate whether these are valued with discount and if so, in which percentage. The main purpose of the thesis is to create a methodology to investors, which is not only statistically significant but also economically beneficial to be used in stock investment decisions, works in real life into profitable returns. Moreover, since research is limited in the literature, this study aims to contribute to the valuation studies.

First, the valuation methods are reviewed to find the most suitable one for the holdings and their subsidiaries. In the following part, the holding companies are reviewed both in general and under the scope of research question. This thesis applied Sum of the parts (SOTP) technique to value holding companies and it requires application of several criteria. First, holding company should have at least one publicly traded subsidiary and, publicly traded subsidiaries should represent the holding company properly. Therefore, the holding companies listed on XHOLD are reviewed to detect the ones which fit the determined criteria. In this point, holdings' ownership rates of public-traded subsidiaries are calculated. Later, public-traded subsidiaries are valued depending on their operations, either manufacturing or financial services. If subsidiary is a financial service firm, the value is calculated by excess return model, on the other

hand, if subsidiary is a manufacturing firm, then the value is calculated by free cash flow to firm technique. Both methods are clarified while applying to two of the subsidiaries of KCHOL as an example. Also, since valuation process requires making assumptions, these are explained under respective headings. After calculation of the values of subsidiaries, the findings are multiplied by the ownership rates and the result is divided by total shares of holding companies. In this point, the computed value is derived from re-valuation public-traded subsidiaries. Moreover, the assumption of the paper is that the value derived from non-publicly traded substitutes equals to the value derived from public-traded subsidiaries in percentage. In parallel to these, the cumulative fair value is figured. As a result, the fair values for five holdings are calculated: Koç Holding (KCHOL), Sabancı Holding (SAHOL), AG Anadolu Grubu Holding (AGHOL), Eczacıbaşı Yatırım Holding Ortaklığı (ECZYT) and Mazhar Zorlu Holding (MZHLD). The discount rates of holding companies are calculated by comparing the fair value with actual stock value. The valued five holding companies consist of 67% of total market cap of XHOLD at the end of 2020. KCHOL accounts for 41% of the index and it is discounted by 70%. SAHOL is 18% of the index and it is discounted by 86%. AGHOL is 5% of the index and discounted by 81%. Therefore, the results show that 64% of the index is discounted between 70%-86%.

Furthermore, five holding companies are valued by using SOTP technique while using the market values of their subsidiaries between 2011 and 2022. As a result, KCHOL is traded with 62% discount whereas the rate for SAHOL is 71%, for AGHOL is 76%, for ECZYT is 14% and for MZHLD is 55% in 2020. For the other years, the rates vary and there is no trend or direct relationship between the discount and the rate of public-traded. In summary, five holding companies are traded with discount between 14% and 76% when the values are derived from their subsidiaries' market values.

To conclude, both fair values show that holding seventeen companies listed on BIST are traded with discount compared to the values derived from their substitutes. There are some holding companies overvalued according to the findings. Further, the findings based on both approaches reveal that five holding companies are discounted at rates that are comparable to those of South Korean holdings instead of the USA in 2020.

As stated before, holdings do not operate on their own, but participate in the management of their subsidiaries, thus, a holding company is considered as a portfolio.

One of the main advantages of portfolio is reducing the risk because of the diversification. Since holdings are traded at a discount in the market based on the results under particular assumptions and considering the advantage of reducing the risk, holdings can be an investment opportunity for investors in practice. Moreover, the management team of the holding companies may investigate the reason of the discount and take actions accordingly. Furthermore, this study may add value to the literature since there are limited study done regarding holding valuation.

In this thesis, totally seventeen, mainly five holding companies are valued. Valuation of other holding companies may result in different findings. Therefore, more comprehensive study may be needed to understand the holding company's position on the index clearly. Another limitation of the thesis is that not all subsidiaries are publicly traded, so there is limited access to financial data. In addition, it is assumed that non-public companies have the same performance as the public-traded ones. Moreover, valuation methods require several assumptions, and these may vary per researchers. Furthermore, macroeconomic, and global factors are ignored in the thesis, such as Covid-19. However, these may have an impact on stock markets, corporations and holding companies.

In the next step, same or similar analysis can be done for more holding companies to reflect index's position as a whole. Also, fair values and the discount rates, if exists, of holding companies may be compared within different countries, especially the ones have similar economic status, such as developing countries, at the same GDP level. Moreover, different valuation methods may be applied for holdings and the results may be compared to check consistency between different techniques. Furthermore, the reasons why holding companies are traded with discount with different rates may be analysed.

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APPENDICES

APPENDIX A: Valuation assumptions for the five holding substitutes

APPENDIX A

Substitute Companies	Holding Codes	Valuation Assumptions (In addition to the main assumptions)
Arçelik A.Ş.	KCHOL	NWC is forecasted by the average ratio of historical NWC ratios. COGS are estimated by the average ratios.
Aygaz A.Ş.	KCHOL	Other income and expense from operating activities and AP are estimated by the recent ratio in order to reflect the company's current financial position and the trend. PPE is forecasted by 3%, which is computed by the decreasing trend of the PPE/Revenue ratio.
Ford Otomotiv Sanayi A.Ş.	KCHOL	PPE is forecasted by the recent PPE/Revenue ratio.
Marmaris Altınyunus	KCHOL	Since there is no interest expense, cost of debt equals to risk free rate.
Otokar Otomotiv Ve Savunma Sanayi Anonim Şirketi	KCHOL	AR, INV, AP and other income from operating activities are forecasted by the average ratios. COGS and G&A expenses are forecasted by the recent ratio.
Tat Gıda Sanayi A.Ş.	KCHOL	COGS, G&A expense, and PPE are forecasted by the recent ratio.
Tofaş Türk Otomobil Fabrikası A.Ş.	KCHOL	The valuation is detailly explained in the thesis. There is no additional valuation assumption.
Türk Traktör Ve Ziraat Makineleri A.Ş.	KCHOL	AP, G&A expense and INV are forecasted by the recent ratio.
Türkiye Petrol Rafinerileri	KCHOL	AR is forecasted by the recent ratio. PPE is forecasted by the average of the historical ratios. Revenue is forecasted by the average of the historical ratios excluding the recent ratio.
Yapı ve Kredi Bankası A.Ş.	KCHOL	Since there is no industry debt and equity weight as a target, the company's own ratios are used based on the current book values. The valuation is detailly explained in the thesis. There is no additional valuation assumption.
Koray Gayrimenkul Yatırım Ortaklığı A.S	KCHOL	Revenue is forecasted by the recent ratio. Since there is no interest expense, cost of debt equals to risk free rate.

		Since there is no industry debt and equity weight as a target, the company's own ratios are used based on the current book values.
Akbank T.A.Ş.	SAHOL	There is no additional valuation assumption.
Akçansa Çimento Sanayi ve Ticaret A.Ş.	SAHOL	COGS are estimated by the average ratios.
Aksigorta A.Ş.	SAHOL	There is no additional valuation assumption.
Avivasa Emeklilik ve Hayat A.Ş.	SAHOL	There is no additional valuation assumption.
Brisa Bridgestone Sabancı Lastik Sanayi ve Ticaret A.Ş.	SAHOL	Revenue, other income, and expense from operating activities are estimated by the average ratios.
Carrefoursa Carrefour Sabancı Ticaret Merkezi A.Ş.	SAHOL	COGS, S&M Expense, R&D Expense, PPE, AR, INV and AP are estimated by the recent ratio in order to reflect the company's current financial position and the trend.
Çimsa Çimento Sanayi ve Ticaret A.Ş.	SAHOL	Revenue, COGS, S&M expense, and G&A expense are estimated by the recent ratios in order to reflect the company's current financial position and the trend.
Kordsa Global Endüstriyel İplik ve Kord Bezi Sanayi ve Ticaret A.Ş.	SAHOL	Other expense from operating activities is forecasted by 0% considering the decrease trend.
Teknosa İç ve Dış Ticaret A.Ş.	SAHOL	There is no additional valuation assumption.
Adel Kalemcilik Ticaret ve Sanayi A.Ş.	AGHOL	Revenue, other income, and expense from operating activities are forecasted by the recent ratios. COGS is forecasted by the average of the historical ratios excluding the recent ratio. NWC is forecasted by the recent ratio, the increase of the current year's value compared to the previous year.
Anadolu Efes Biracılık ve Malt Sanayi A.Ş.	AGHOL	G&A expense is forecasted by the recent ratio.
Anadolu Isuzu Otomotiv Sanayi ve Ticaret A.Ş.	AGHOL	COGS and PPE are forecasted by the recent ratios. NWC is forecasted by the average of last two years' increase ratios compare to the previous years.
Coca-Cola İçecek A.Ş.	AGHOL	There is no additional valuation assumption.
Migros Ticaret A.S	AGHOL	There is no additional valuation assumption.

Eis Eczacıbaşı İlaç, Sınai ve Finansal Yatırımlar Sanayi ve Ticaret A.Ş.	ECZYT	G&A expense, D&A and PPE are forecasted by the recent ratios. R&D Expense is forecasted by 0% since for the last four years, there is no R&D expense. Revenue is forecasted by 26% which equals to the growth rate in 2019. COGS and other income from operating activities are forecasted by the recent ratios.
Intema İnşaat ve Tesisat Malzemeleri Yatırım ve Pazarlama A.S	ECZYT	S&M expense and G&A expense are forecasted by the average ratios of the historical ratios excluding the recent ones. Revenue is forecasted by 1.36% which equals to the average of the ratios between 2016 and 2018 since there are negative revenues for the last two years.
Ege Plastik Ticaret ve Sanayi A.Ş.	MZHLD	There is no additional valuation assumption.

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